

## DAFTAR PUSTAKA

- Agatha, F. S., Mustahal, M., Syamsunarno, M. B., & Herjayanto, M. 2021. Early Study on Embryogenesis *O.woworae* at Different Salinities. *Jurnal Biologi Tropis*, 21(2), 343. <https://doi.org/10.29303/jbt.v21i2.2574>
- Al-Yamani, F. Y., Polikarpov, I., & Saburova, M. 2020. Marine life mortalities and Harmful Algal Blooms in the Northern Arabian Gulf. *Aquatic Ecosystem Health and Management*, 23(2), 196–209. <https://doi.org/10.1080/14634988.2020.1798157>
- Ali, M., Taite, D., Irving, R., Kutub Ali, M., Poulakchi Saber, S., Ricardo Taite, D., & Emadi, S. 2017. *The Protective Layer of Zebrafish Embryo Changes Continuously with Advancing Ages of Embryo Development (AGED) Biochemistry of the Alzheimer's disease View project Learning through Synchronous Synaptic Activity View project The Protective Layer of Zebrafis. July.* <https://www.researchgate.net/publication/318983759>
- Amal, M. N. A., Ismail, A., Saad, M. Z., Md Yasin, I. S., Nasruddin, N. S., Mastor, S. S., Abdul Rahman, M. H., & Mohamad, N. (2019). Study on Streptococcus agalactiae infection in Javanese medaka (*Oryzias javanicus* Bleeker, 1854) model. *Microbial Pathogenesis*, 131(February), 47–52. <https://doi.org/10.1016/j.micpath.2019.03.034>
- Amaliah, R., Amrullah, & Suriati. 2018. Manajemen Pemberian Pakan Pada Pembesaran Ikan Nila (*Oreochromis niloticus*). *Prosiding Seminar Nasional Pertama Sinergitas Multidisiplin Ilmu Pengetahuan Dan Teknologi*, 1(1), 252–257.
- Amin, N., Zulkifli, S. Z., Azmai, M. N. A., & Ismail, A. 2021. Toxicity of zinc oxide nanoparticles on the embryo of javanese medaka (*Oryzias javanicus* bleeker, 1854): A comparative study. *Animals*, 11(8), 1–12. <https://doi.org/10.3390/ani11082170>
- Ardhardiansyah, Subhan, U., & Yustiati, A. 2017. Embriogenesis Dan Karakteristik Larva Persilangan Ikan Patin Siam (*Pangasius Hypophthalmus*) Jantan Dengan Ikan Baung (*Hemibagrus Nemurus*) Betina. *Jurnal Perikanan Dan Kelautan*, 8(2), 17–27. <https://www.neliti.com/publications/482766/embriogenesis-dan-karakteristik-larva-persilangan-ikan-patin-siam-pangasius-hypo>
- Atherton, J. A., & McCormick, M. I. 2015. Active in the sac: Damselfish embryos use innate recognition of odours to learn predation risk before hatching. *Animal Behaviour*, 103, 1–6. <https://doi.org/10.1016/j.anbehav.2015.01.033>
- Aziz, F. Z. A., Syaizwan, Z. Z., Ferdaus, M.-Y., Mohammad, N. A. A., & Ahmad, I. 2017. A Histological Study on Mercury-Induced Gonadal Impairment in Javanese Medaka (*Oryzias javanicus*). *Turkish Journal of Fisheries and Aquatic Sciences*, 17(1), 51–60. <https://doi.org/10.4194/1303-2712-v17>
- Baden, D. G., & Adams, D. J. 2000. Brevetoxins: chemistry, mechanism of action, and methods of detection. *Food Science And Technology-New York-Marcel Dekker-*, 505–532.
- Barjhoux, I., Baudrimont, M., Morin, B., Landi, L., Gonzalez, P., & Cachot, J. 2012. Effects of copper and cadmium spiked-sediments on embryonic development of Japanese medaka (*Oryzias latipes*). *Ecotoxicology and Environmental Safety*, 79, 272–282. <https://doi.org/10.1016/j.ecoenv.2012.01.011>

- Belanger, S. E., Rawlings, J. M., & Carr, G. J. 2013. Use of fish embryo toxicity tests for the prediction of acute fish toxicity to chemicals. *Environmental Toxicology and Chemistry*, 32(8), 1768–1783. <https://doi.org/10.1002/etc.2244>
- Berdalet, E., Fleming, L. E., Gowen, R., Davidson, K., Hess, P., Backer, L. C., Moore, S. K., Hoagland, P., & Enevoldsen, H. 2016. Marine harmful algal blooms, human health and wellbeing: Challenges and opportunities in the 21st century. *Journal of the Marine Biological Association of the United Kingdom*, 96(1), 61–91. <https://doi.org/10.1017/S0025315415001733>
- Berry, J. P., Gantar, M., Gibbs, P. D. L., & Schmale, M. C. 2007. The zebrafish (*Danio rerio*) embryo as a model system for identification and characterization of developmental toxins from marine and freshwater microalgae. *Comparative Biochemistry and Physiology - C Toxicology and Pharmacology*, 145(1), 61–72. <https://doi.org/10.1016/j.cbpc.2006.07.011>
- Blagojević, D., Babić, O., Kaišarević, S., Stanić, B., Mihajlović, V., Davidović, P., Marić, P., Smital, T., & Simeunović, J. 2021. Evaluation of cyanobacterial toxicity using different biotests and protein phosphatase inhibition assay. *Environmental Science and Pollution Research*, 28(35), 49220–49231. <https://doi.org/10.1007/s11356-021-14110-2>
- Callegari, F., & Rossini, G. P. 2008. Yessotoxin inhibits the complete degradation of E-cadherin. *Toxicology*, 244(2–3), 133–144. <https://doi.org/10.1016/j.tox.2007.11.007>
- Colman, J. R., Twiner, M. J., Hess, P., McMahon, T., Satake, M., Yasumoto, T., Doucette, G. J., & Ramsdell, J. S. 2005. Teratogenic effects of azaspiracid-1 identified by microinjection of Japanese medaka (*Oryzias latipes*) embryos. *Toxicol*, 45(7), 881–890. <https://doi.org/10.1016/j.toxicol.2005.02.014>
- Davidović, P., Blagojević, D., Meriluoto, J., Simeunović, J., & Svirčev, Z. 2023. Biotests in Cyanobacterial Toxicity Assessment—Efficient Enough or Not? *Biology*, 12(5), 1–41. <https://doi.org/10.3390/biology12050711>
- De Wit, P., Rogers-Bennett, L., Kudela, R. M., & Palumbi, S. R. 2014. Forensic genomics as a novel tool for identifying the causes of mass mortality events. *Nature Communications*, 5, 1–8. <https://doi.org/10.1038/ncomms4652>
- Dharma, T. S. 2015. Embryo Development And Endogeneous Nutrient Absorption Of Sea Silver Pompano Fish Larvae From Natural Spawan of Broodstock, *Trachinotus blochii*, Lac. *Jurnal Ilmu Dan Teknologi Kelautan Tropis*, 7(1), 83–90. <https://doi.org/10.29244/jitkt.v7i1.9782>
- Dominguez, H. J., Paz, B., Daranas, A. H., Norte, M., Franco, J. M., & Fernández, J. J. 2010. Dinoflagellate polyether within the yessotoxin, pectenotoxin and okadaic acid toxin groups: Characterization, analysis and human health implications. *Toxicol*, 56(2), 191–217. <https://doi.org/10.1016/j.toxicol.2009.11.005>
- Embry, M. R., Belanger, S. E., Braunbeck, T. A., Galay-Burgos, M., Halder, M., Hinton, D. E., Léonard, M. A., Lillicrap, A., Norberg-King, T., & Whale, G. 2010. The fish embryo toxicity test as an animal alternative method in hazard and risk assessment and scientific research. *Aquatic Toxicology*, 97(2), 79–87. <https://doi.org/10.1016/j.aquatox.2009.12.008>
- Escoffier, N., Gaudin, J., Mezhoud, K., Chateau-joubert, S., Turquet, J., & Edery, M.

2007. Toxicity to medaka fish embryo development of okadaic acid and crude extracts of *Prorocentrum* dinoflagellates. *49*, 1182–1192. <https://doi.org/10.1016/j.toxicon.2007.02.008>
- Fey, S. B., Siepielski, A. M., Nusslé, S., Cervantes-Yoshida, K., Hwan, J. L., Huber, E. R., Fey, M. J., Catenazzi, A., & Carlson, S. M. 2015. Recent shifts in the occurrence, cause, and magnitude of animal mass mortality events. *Proceedings of the National Academy of Sciences of the United States of America*, *112*(4), 1083–1088. <https://doi.org/10.1073/pnas.1414894112>
- Franchini, A., Malagoli, D., & Ottaviani, E. 2010. Targets and effects of yessotoxin, okadaic acid and palytoxin: A differential review. *Marine Drugs*, *8*(3), 658–677. <https://doi.org/10.3390/md8030658>
- Gobler, C. J. 2020. Climate Change and Harmful Algal Blooms: Insights and perspective. *Harmful Algae*, *91*(December), 101731. <https://doi.org/10.1016/j.hal.2019.101731>
- González-Doncel, M., Okihiro, M. S., Villalobos, S. A., Hinton, D. E., & Tarazona, J. V. 2005. A quick reference guide to the normal development of *Oryzias latipes* (Teleostei, Adrianichthyidae). *Journal of Applied Ichthyology*, *21*(1), 39–52. <https://doi.org/10.1111/j.1439-0426.2004.00615.x>
- Hallare, A. V., Kosmehl, T., Schulze, T., Hollert, H., Köhler, H. R., & Triebkorn, R. 2005. Assessing contamination levels of Laguna Lake sediments (Philippines) using a contact assay with zebrafish (*Danio rerio*) embryos. *Science of the Total Environment*, *347*(1–3), 254–271. <https://doi.org/10.1016/j.scitotenv.2004.12.002>
- Hallegraeff, G., Enevoldsen, H., & Zingone, A. 2021. Global harmful algal bloom status reporting. *Harmful Algae*, *102*. <https://doi.org/10.1016/j.hal.2021.101992>
- Hano, T., Oshima, Y., Kim, S. G., Satone, H., Oba, Y., Kitano, T., Inoue, S., Shimasaki, Y., & Honjo, T. 2007. Tributyltin causes abnormal development in embryos of medaka, *Oryzias latipes*. *Chemosphere*, *69*(6), 927–933. <https://doi.org/10.1016/j.chemosphere.2007.05.093>
- Harris, M. P., Henke, K., Hawkins, M. B., & Witten, P. E. 2014. Fish is Fish: The use of experimental model species to reveal causes of skeletal diversity in evolution and disease. *Journal of Applied Ichthyology*, *30*(4), 616–629. <https://doi.org/10.1111/jai.12533>
- Heming, T. A., & Randal, K. B. 1988. Yolk absorption in embryonic and larval fishes. *Nutrition*, *XI*, 1988–1988.
- Hornig, C. Y., Lin, H. C., & Lee, W. 2010. A reproductive toxicology study of phenanthrene in medaka (*Oryzias latipes*). *Archives of Environmental Contamination and Toxicology*, *58*(1), 131–139. <https://doi.org/10.1007/s00244-009-9335-6>
- Imai, S., Koyama, J., & Fujii, K. 2007. Effects of estrone on full life cycle of Java medaka (*Oryzias javanicus*), a new marine test fish. *Environmental Toxicology and Chemistry*, *26*(4), 726–731. <https://doi.org/10.1897/05-539R2.1>
- Irawan, A., Hasani, Q., & Yuliyanto, H. 2017. Fenomena Harmful Algal Blooms (HABs) di Pantai Ringgung Teluk Lampung, Pengaruhnya dengan Tingkat Kematian Ikan yang Dibudidayakan pada Karamba Jaring Apung. *Jurnal Penelitian Pertanian Terapan*, *15*(1), 48–53. <https://doi.org/10.25181/jppt.v15i1.111>

- Ismail, A., & Yusof, S. 2011. Effect of mercury and cadmium on early life stages of Java medaka (*Oryzias javanicus*): A potential tropical test fish. *Marine Pollution Bulletin*, 63(5–12), 347–349. <https://doi.org/10.1016/j.marpolbul.2011.02.014>
- Iwamatsu, T. 2004. Stages of normal development in the medaka *Oryzias latipes*. *Mechanisms of Development*, 121(7–8), 605–618. <https://doi.org/10.1016/j.mod.2004.03.012>
- Jacquet, C., Thermes, V., De Luze, A., Puiseux-Dao, S., Bernard, C., Joly, J. S., Bourrat, F., & Edery, M. 2004. Effects of microcystin-LR on development of medaka fish embryos (*Oryzias latipes*). *Toxicol*, 43(2), 141–147. <https://doi.org/10.1016/j.toxicol.2003.11.010>
- Jain-Schlaepfer, S., Fakan, E., Rummer, J. L., Simpson, S. D., & McCormick, M. I. 2018. Impact of motorboats on fish embryos depends on engine type. *Conservation Physiology*, 6(1), 1–9. <https://doi.org/10.1093/conphys/coy014>
- Kenjiro, Y. 1997. A Short History of the Hatching Enzyme Studies in Medaka (< Special Issue> Development of Medaka Biology in Japan-Part II). *The Fish Biology Journal Medaka*, 9, 5–15.
- Korsnes, M. S., Hetland, D. L., Espenes, A., & Aune, T. 2006. Induction of apoptosis by YTX in myoblast cell lines via mitochondrial signalling transduction pathway. *Toxicology in Vitro*, 20(8), 1419–1426. <https://doi.org/10.1016/j.tiv.2006.06.015>
- Liao, P. H., Hwang, C. C., Chen, T. H., & Chen, P. J. 2015. Developmental exposures to waterborne abused drugs alter physiological function and larval locomotion in early life stages of medaka fish. *Aquatic Toxicology*, 165, 84–92. <https://doi.org/10.1016/j.aquatox.2015.05.010>
- Likumahua, S., de Boer, M. K., Krock, B., Nieuwenhuizen, T., Tatipatta, W. M., Hehakaya, S., Imu, L., Abdul, M. S., Moniharapon, E., & Buma, A. G. J. 2019. First record of the dynamics of domoic acid producing *Pseudo-nitzschia* spp. in Indonesian waters as a function of environmental variability. *Harmful Algae*, 90(April), 101708. <https://doi.org/10.1016/j.hal.2019.101708>
- Liu, K., Song, J., Chi, W., Liu, H., Ge, S., & Yu, D. 2021. Developmental toxicity in marine medaka (*Oryzias melastigma*) embryos and larvae exposed to nickel. *Comparative Biochemistry and Physiology Part - C: Toxicology and Pharmacology*, 248(7), 109082. <https://doi.org/10.1016/j.cbpc.2021.109082>
- Manfrin, C., De Moro, G., Torboli, V., Venier, P., Pallavicini, A., & Gerdol, M. 2012. Physiological and molecular responses of bivalves to toxic dinoflagellates. *Invertebrate Survival Journal*, 9(2), 184–199.
- Mohamat-Yusuff, F., Sarah-Nabila, A. G., Zulkifli, S. Z., Azmai, M. N. A., Ibrahim, W. N. W., Yusof, S., & Ismail, A. 2018. Acute toxicity test of copper pyrithione on Javanese medaka and the behavioural stress symptoms. *Marine Pollution Bulletin*, 127(May 2017), 150–153. <https://doi.org/10.1016/j.marpolbul.2017.11.046>
- Mohamed, Z. A. 2018. Potentially harmful microalgae and algal blooms in the Red Sea: Current knowledge and research needs. *Marine Environmental Research*, 140(June), 234–242. <https://doi.org/10.1016/j.marenvres.2018.06.019>
- Ni, X., & Shen, Y. 2021. Transgenerational effects of hexavalent chromium on marine

- medaka (*Oryzias melastigma*) reveal complex transgenerational adaptation in offspring. *Biomolecules*, 11(2), 1–16. <https://doi.org/10.3390/biom11020138>
- OECD. 2004. OECD Environment, Health and Safety Publications Series on Testing and Assessment No 47. *Review Apper Onfish Screening Assays for the Detection of Endocrine Actrive Substances. OECD Series on Testing and Assessment*, 47, 1–44.
- Orlova, T. Y., & Morozova, T. V. 2013. Dinoflagellate cysts in recent marine sediments of the western coast of the Bering Sea. *Russian Journal of Marine Biology*, 39(1), 15–29. <https://doi.org/10.1134/S1063074013010069>
- Oyen, F. G. F., Camps, L. E. C. M. M., & Wendelaar Bonga, S. E. 1991. Effect of acid stress on the embryonic development of the common carp (*Cyprinus carpio*). *Aquatic Toxicology*, 19(1), 1–12. [https://doi.org/10.1016/0166-445X\(91\)90024-4](https://doi.org/10.1016/0166-445X(91)90024-4)
- Padilla, S., Cowden, J., Hinton, D. E., Yuen, B., Kullman, S. W., Johnson, R., Hardman, R. C., & Au, D. W. T. 2009. Use of Medaka in Toxicity Testing. *Current Protocols in Toxicology*, 1–36. <https://doi.org/10.1002/0471140856.tx0110s39>
- Palíková, M., Krejčí, R., Hilscherová, K., Babica, P., Navrátil, S., Kopp, R., & Bláha, L. 2007. Effect of different cyanobacterial biomasses and their fractions with variable microcystin content on embryonal development of carp (*Cyprinus carpio* L.). *Aquatic Toxicology*, 81(3), 312–318. <https://doi.org/10.1016/j.aquatox.2007.01.001>
- Parenti, L. R. 2008. A phylogenetic analysis and taxonomic revision of ricefishes, *Oryzias* and relatives (*Beloniformes*, *Adrianichthyidae*). *Zoological Journal of the Linnean Society*, 154(3), 494–610. <https://doi.org/10.1111/j.1096-3642.2008.00417.x>
- Puangchit, P., Ishigaki, M., Yasui, Y., Kajita, M., Ritthiruangdej, P., & Ozaki, Y. 2017. Non-staining visualization of embryogenesis and energy metabolism in medaka fish eggs using near-infrared spectroscopy and imaging. *Analyst*, 142(24), 4765–4772. <https://doi.org/10.1039/c7an01575e>
- Puspitasari, R., & Suratno, . 2017. Preliminary Study Of Larval Development *Oryzias Javanicus* In Indonesia. *Jurnal Ilmu Dan Teknologi Kelautan Tropis*, 9(1), 105–112. <https://doi.org/10.29244/jitkt.v9i1.17920>
- Rhodes, L., McNabb, P., De Salas, M., Briggs, L., Beuzenberg, V., & Gladstone, M. 2006. Yessotoxin production by *Gonyaulax spinifera*. *Harmful Algae*, 5(2), 148–155. <https://doi.org/10.1016/j.hal.2005.06.008>
- Rodriguez, J.N., Oteme, Z.J. & Hem, S. 1995. Comparative study of vitellogenesis of two African catfish species *Chrysichthys nigrodigiatus* (Claroteidae) and *Heterobranchus longifilis* (Clariidae). *Aquatic Living Resources*. 8(4):291-296.
- Rountos, K. J., Kim, J. J., Hattenrath-Lehmann, T. K., & Gobler, C. J. 2019. Effects of the harmful algae, *Alexandrium catenella* and *Dinophysis acuminata*, on the survival, growth, and swimming activity of early life stages of forage fish. *Marine Environmental Research*, 148(April), 46–56. <https://doi.org/10.1016/j.marenvres.2019.04.013>
- Rubini, S., Albonetti, S., Menotta, S., Cervo, A., Callegari, E., Cangini, M., Ara, S. D., Baldini, E., Vertuani, S., & Manfredini, S. 2021. Northwestern Adriatic Sea. *Toxins*, 13, 2–15.

- Ryuzono, S., Takase, R., Kamada, Y., Ikenaga, T., Chigwechokha, P. K., Komatsu, M., & Shiozaki, K. 2017. Suppression of Neu1 sialidase delays the absorption of yolk sac in medaka (*Oryzias latipes*) accompanied with the accumulation of  $\alpha$ 2-3 sialoglycoproteins. *Biochimie*, 135, 63–71. <https://doi.org/10.1016/j.biochi.2017.01.008>
- Santos, S. W., Cachot, J., Gourves, P. Y., Cl randeau, C., Morin, B., & Gonzalez, P. 2019. Sub-lethal effects of waterborne copper in early developmental stages of rainbow trout (*Oncorhynchus mykiss*). *Ecotoxicology and Environmental Safety*, 170(December 2018), 778–788. <https://doi.org/10.1016/j.ecoenv.2018.12.045>
- Saraf, S. R., Frenkel, A., Harke, M. J., Jankowiak, J. G., Gobler, C. J., & McElroy, A. E. 2018. Effects of *Microcystis* on development of early life stage Japanese medaka (*Oryzias latipes*): Comparative toxicity of natural blooms, cultured *Microcystis* and microcystin-LR. *Aquatic Toxicology*, 194(July 2017), 18–26. <https://doi.org/10.1016/j.aquatox.2017.10.026>
- Sarkar, S. K. 2018. Harmful Algal Blooms (HABs). In *Marine Algal Bloom: Characteristics, Causes and Climate Change Impacts*. [https://doi.org/10.1007/978-981-10-8261-0\\_3](https://doi.org/10.1007/978-981-10-8261-0_3)
- Scholz, S., Fischer, S., G ndel, U., K ster, E., Luckenbach, T., & Voelker, D. 2008. The zebrafish embryo model in environmental risk assessment - Applications beyond acute toxicity testing. *Environmental Science and Pollution Research*, 15(5), 394–404. <https://doi.org/10.1007/s11356-008-0018-z>
- Schubert, S., Keddig, N., Hanel, R., & Kammann, U. 2014. Microinjection into zebrafish embryos (*Danio rerio*) - a useful tool in aquatic toxicity testing? *Environmental Sciences Europe*, 26(1). <https://doi.org/10.1186/s12302-014-0032-3>
- Sidabutar, T., Srimariana, E. S., & Wouthuyzen, S. 2021. Phytoplankton species potentially harmful algal blooms (HABs) in Jakarta Bay. *IOP Conference Series: Earth and Environmental Science*, 744(1). <https://doi.org/10.1088/1755-1315/744/1/012077>
- Sulistiawan R, S. N., & Rukoyah. 2014. Pengaruh Pemberian lama Waktu Kejutan Suhu Terhadap Tingkat Keberhasilan Ginogenesis Ikan Koi (*Cyprinus carpio*). *Agroscience*, 7, 103–111.
- Supriono, E., Lisnawati, L., & Djokosetianto, D. 2005. Pengaruh Linear Alkylbenzene Sulfonate Terhadap Mortalitas, Daya Tetas Telur dan Abnormalitas Larva Ikan Patin (*Pangasius hypophthalmus Sauvage*). *Jurnal Akuakultur Indonesia*, 4(1), 69–78.
- Suteja, Y., Dirgayusa, I. G. N. P., Afdal, Cordova, M. R., Rachman, A., Rintaka, W. E., Takarina, N. D., Putri, W. A. E., Isnaini, & Purwiyanto, A. I. S. 2021. Identification of potentially harmful microalgal species and eutrophication status update in Benoa Bay, Bali, Indonesia. *Ocean and Coastal Management*, 210(May), 105698. <https://doi.org/10.1016/j.ocecoaman.2021.105698>
- Swanson, C. 1996. Early development of milkfish: Effects of salinity on embryonic and larval metabolism, yolk absorption and growth. *Journal of Fish Biology*, 48(3), 405–421. <https://doi.org/10.1111/j.1095-8649.1996.tb01436.x>
- Termvidchakorn, A., & Magtoon, W. 2008. Development and identification of the ricefish *Oryzias* in Thailand. *ScienceAsia*, 34(4), 416–423.

<https://doi.org/10.2306/scienceasia1513-1874.2008.34.416>

- Trinchet, I., Djediat, C., Huet, H., Dao, S. P., & Edery, M. 2011. Pathological modifications following sub-chronic exposure of medaka fish (*Oryzias latipes*) to microcystin-LR. *Reproductive Toxicology*, 32(3), 329–340. <https://doi.org/10.1016/j.reprotox.2011.07.006>
- Turner, A. D., Lewis, A. M., Bradley, K., & Maskrey, B. H. 2021. Marine invertebrate interactions with Harmful Algal Blooms – Implications for One Health. *Journal of Invertebrate Pathology*, 186(February), 107555. <https://doi.org/10.1016/j.jip.2021.107555>
- Unus, F., & Omar, S. B. A. 2010. Analisis Fekunditas dan Diameter Telur Ikan Malalugis Biru (*Decapterus malalugis* Cuvier, 1833) di Perairan Kabupaten Banggai Kepulauan, Provinsi Sulawesi Tengah. *Torani (Jurnal Ilmu Kelautan Dan Perikanan)*, 20(1), 37–43.
- Vasconcelos, V., Azevedo, J., Silva, M., & Ramos, V. 2010. Effects of marine toxins on the reproduction and early stages development of aquatic organisms. *Marine Drugs*, 8(1), 59–79. <https://doi.org/10.3390/md8010059>
- Wang, L., Wang, Q., Xiao, G., Chen, G., Han, L., & Hu, T. 2020. Adverse effect of cylindrospermopsin on embryonic development in zebrafish (*Danio rerio*). *Chemosphere*, 241(174), 125060. <https://doi.org/10.1016/j.chemosphere.2019.125060>
- Wang, R. F., Zhu, L. M., Zhang, J., An, X. P., Yang, Y. P., Song, M., & Zhang, L. 2020. Developmental toxicity of copper in marine medaka (*Oryzias melastigma*) embryos and larvae. *Chemosphere*, 247, 125923. <https://doi.org/10.1016/j.chemosphere.2020.125923>
- Watson, S. B., Whitton, B. A., Higgins, S. N., Paerl, H. W., Brooks, B. W., & Wehr, J. D. 2015. Harmful Algal Blooms. In *Freshwater Algae of North America: Ecology and Classification*. Elsevier Inc. <https://doi.org/10.1016/B978-0-12-385876-4.00020-7>
- Yudasmara, G. . 2014. *Biologi Perikanan*. Plantaxia.
- Yusof, S., Ismail, A., & Alias, M. S. 2014. Effect of glyphosate-based herbicide on early life stages of Java medaka (*Oryzias javanicus*): A potential tropical test fish. *Marine Pollution Bulletin*, 85(2), 494–498. <https://doi.org/10.1016/j.marpolbul.2014.03.022>
- Zhang, Z., Hu, J., Zhen, H., Wu, X., & Huang, C. 2008. Reproductive inhibition and transgenerational toxicity of triphenyltin on medaka (*Oryzias latipes*) at environmentally relevant levels. *Environmental Science and Technology*, 42(21), 8133–8139. <https://doi.org/10.1021/es801573x>

## **LAMPIRAN**



Lampiran 1. Data dan hasil analisis statistik menggunakan uji Kruskal- Wallis jumlah somit *Oryzias javanicus*

No.	Emb rio	Fase 19	Fase 20	Fase 21	No.	Emb rio	Fase 19	Fase 20	Fase 21
1	A1	4	6	7	21	C1	3	6	8
2	A2	3	6	8	22	C2	4	5	7
3	A3	3	5	7	23	C3	5	6	7
4	A4	3	5	7	24	C4	4	6	8
5	A5	3	5	7	25	C5	4	6	8
6	A6	3	6	8	26	C6	3	5	7
7	A7	4	6	9	27	C7	4	6	9
8	A8	3	6	8	28	C8	4	6	8
9	A9	4	6	8	29	C9	4	5	8
10	A10	3	5	7	30	C10	4	5	7
11	B1	3	5	9	31	D1	3	3	3
12	B2	4	6	8	32	D2	4	4	4
13	B3	3	5	8	33	D3	3	3	3
14	B4	4	6	9	34	D4	5	5	5
15	B5	4	7	8	35	D5	4	4	4
16	B6	3	6	8	36	D6	3	3	3
17	B7	3	5	8	37	D7	4	4	4
18	B8	4	7	8	38	D8	3	3	3
19	B9	3	6	8	39	D9	4	4	4
20	B10	4	5	8	40	D10	3	3	3

Keterangan :

A : Kontrol

B : 50%

C : 75%

D : 100%

Parameter	Data 1
Table Analyzed	
Kruskal-Wallis test	
P value	0.8469
Exact or approximate P value?	Gaussian Approximation
P value summary	ns
Do the medians vary signif. (P < 0.05)	No
Number of groups	4
Kruskal-Wallis statistic	0.8105
Dunn's Multiple Comparison Test	Difference in rank sum Significant? P < 0.05? Summary
Kontrol vs 50%	-0.6667 No ns
Kontrol vs 75%	0.8333 No ns
Kontrol vs 100%	1.833 No ns
50% vs 75%	1.500 No ns
50% vs 100%	2.500 No ns
75% vs 100%	1.000 No ns

Lampiran 2. Data dan hasil analisis statistik menggunakan uji Kruskal-Wallis diameter telur *Oryzias javanicus*

Parameter	Data 1
Table Analyzed	
Kruskal-Wallis test	
P value	0.1779
Exact or approximate P value?	Gaussian Approximation
P value summary	ns
Do the medians vary signif. (P < 0.05)	No
Number of groups	4
Kruskal-Wallis statistic	4.918
Dunn's Multiple Comparison Test	Difference in rank sum Significant? P < 0.05? Summary
Kontrol vs 50%	0.0 No ns
Kontrol vs 75%	-11.97 No ns
Kontrol vs 100%	-10.34 No ns
50% vs 75%	-11.97 No ns
50% vs 100%	-10.34 No ns
75% vs 100%	1.632 No ns

Lampiran 3. Data dan hasil analisis statistik menggunakan uji Kruskal- Wallis volume kuning telur *Oryzias javanicus*

<b>Fase</b>	<b>Kontrol</b>	<b>50%</b>	<b>75%</b>	<b>100%</b>
19	0.85	0.59	0.58	0.55
20	0.78	0.54	0.55	0.53
21	0.73	0.52	0.51	0.51
22	0.71	0.51	0.49	0.48
23	0.70	0.50	0.48	0.46
24	0.65	0.50	0.46	0.44
25	0.62	0.48	0.45	0.41
26	0.59	0.48	0.43	0.43
27	0.54	0.47	0.43	0.40
28	0.52	0.45	0.41	0.39
29	0.48	0.44	0.36	0.37
30	0.41	0.44	0.32	0.36
31	0.38	0.41	0.26	0.33
32	0.34	0.40	0.25	0.31
33	0.28	0.37	0.21	0.27
34	0.25	0.35	0.23	0.23
35	0.22	0.30	0.17	0.20
36	0.18	0.25	0.16	0.17
37	0.16	0.18	0.13	0.11

Parameter	Data 1
Table Analyzed	
Kruskal-Wallis test	
P value	0.0030
Exact or approximate P value?	Gaussian
P value summary	Approximation
Do the medians vary signif. (P < 0.05)	**
Number of groups	Yes
Kruskal-Wallis statistic	4
	13.92

Dunn's Multiple Comparison Test	Difference in rank sum	Significant? P < 0.05?	Summary
kontrol vs 50%	3.184	No	ns
kontrol vs 75%	20.00	Yes	*
kontrol vs 100%	20.71	Yes	*
50% vs 75%	16.82	No	ns
50% vs 100%	17.53	No	ns
75% vs 100%	0.7105	No	ns

Lampiran 4. Data dan hasil analisis statistik menggunakan uji Kruskal- Wallis laju penyerapan kuning telur *Oryzias javanicus*

Embrio	Kontrol	50%	75%	100%
EOJ1	0.0039	0.0023	0.0026	0.0025
EOJ2	0.0039	0.0030	0.0022	0.0023
EOJ3	0.0038	0.0024	0.0020	0.0022
EOJ4	0.0041	0.0027	0.0025	0.0023
EOJ5	0.0039	0.0025	0.0020	0.0022
EOJ6	0.0043	0.0025	0.0025	0.0022
EOJ7	0.0037	0.0023	0.0021	0.0020
EOJ8	0.0036	0.0024	0.0022	0.0022
EOJ9	0.0030	0.0025	0.0025	0.0018
EOJ10	0.0026	0.0026	0.0020	0.0025

Table Analyzed laju penyerapan

Kruskal-Wallis test

P value < 0.0001

Exact or approximate P value? Gaussian Approximation

P value summary \*\*\*

Do the medians vary signif. (P < 0.05) Yes

Number of groups 4

Kruskal-Wallis statistic 25.99

Dunn's Multiple Comparison Test	Difference in rank sum	Significant? P < 0.05?	Summary
Kontrol vs 50%	13.05	No	ns
Kontrol vs 75%	22.05	Yes	***
Kontrol vs 100%	23.50	Yes	***
50% vs 75%	9.000	No	ns
50% vs 100%	10.45	No	ns
75% vs 100%	1.450	No	ns

Lampiran 5. Data dan hasil analisis statistik menggunakan uji Kruskal- Wallis detak jantung *Oryzias javanicus*

Parameter	Data 1		
Table Analyzed			
Kruskal-Wallis test			
P value	0.0095		
	Gaussian		
Exact or approximate P value?	Approximation		
P value summary	**		
Do the medians vary signif. (P < 0.05)	Yes		
Number of groups	4		
Kruskal-Wallis statistic	11.46		
Dunn's Multiple Comparison Test	Difference in rank sum	Significant? P < 0.05?	Summary
Kontrol vs 50%	15.57	No	ns
Kontrol vs 75%	14.39	No	ns
Kontrol vs 100%	19.46	Yes	**
50% vs 75%	-1.179	No	ns
50% vs 100%	3.893	No	ns
75% vs 100%	5.071	No	ns

Lampiran 6. Data dan hasil analisis statistik menggunakan uji Kruskal- Wallis kelangsungan hidup embrio *Oryzias javanicus*

Embrio	Hidup	EMbrio	Hidup	EMbrio	Hidup	EMbrio	Hidup	Mati
A1	1	B1	1	C1		D1		1
A2	1	B2		C2		D2		1
A3	1	B3	1	C3		D3		1
A4	1	B4	1	C4		D4		1
A5	1	B5	1	C5		D5		1
A6	1	B6	1	C6		D6		1
A7	1	B7	1	C7	1	D7	1	
A8	1	B8	1	C8	1	D8		1
A9	1	B9	1	C9		D9		1
A10	1	B10	1	C10	1	D10		1

Perlakuan	Kelangsungan hidup(%)	Keterangan
A	100	A : Kontrol
B	90	B : 50%
C	30	C : 75%
D	10	D : 100%



Parameter	Data 1
Table Analyzed	
Kruskal-Wallis test	
P value	0.0001
Exact or approximate P value?	Gaussian
P value summary	Approximation
Do the medians vary signif. (P < 0.05)	***
Number of groups	Yes
Kruskal-Wallis statistic	4
	20.88

Dunn's Multiple Comparison Test	Difference in rank sum	Significant? P < 0.05?	Summary
Kontrol vs 50%	4.000	No	ns
Kontrol vs 75%	14.00	Yes	*
Kontrol vs 100%	18.00	Yes	***
50% vs 75%	10.00	No	ns
50% vs 100%	14.00	Yes	*
75% vs 100%	4.000	No	ns

Lampiran 7. Data dan hasil analisis statistik menggunakan uji Kruskal- Wallis panjang larva awal menetas *Oryzias javanicus*

Embrio	Kontrol	50%	75%	100%
EOJ1	4.79	5.22		
EOJ2	4.53			
EOJ3	4.76	5.30		
EOJ4	5.47	5.60		
EOJ5	4.01	5.17		
EOJ6	4.20	5.32		
EOJ7	4.45	5.36	6.34	5.35
EOJ8	5.37	5.28	4.35	
EOJ9	4.15	5.42		
EOJ10	5.14	5.30	5.33	

P value 0.1131  
 Exact or approximate P value? Gaussian Approximation  
 P value summary ns  
 Do the medians vary signif. (P < 0.05) No  
 Number of groups 4  
 Kruskal-Wallis statistic 5.969

Dunn's Multiple Comparison Test	Difference in rank sum	Significant? P < 0.05?	Summary
Kontrol vs 50%	-6.900	No	ns
Kontrol vs 75%	-6.233	No	ns
Kontrol vs 100%	-8.900	No	ns
50% vs 75%	0.6667	No	ns
50% vs 100%	-2.000	No	ns
75% vs 100%	-2.667	No	ns

Lampiran 8. Data dan hasil analisis statistik menggunakan uji Kruskal- Wallis waktu penetasan *Oryzias javanicus*

No.	Waktu penetasan (Hari)	Embrio
1		A1
2		A2
3		A4
4		A5
5	11	A6
6		A7
7		A8
8		A9
9		A3
10	12	A10

No.	Waktu Penetasan (Hari)	Embrio
1		C7
2	12	C10
3	15	C8

No.	Waktu Penetasan (Hari)	Embrio
1	15	D7

No.	Waktu Penetasan (Hari)	Embrio
1		B3
2	12	B4
3		B6
4		B2
5		B7
6	13	B8
7		B9
8		B10
9	15	B1

Parameter	Table Analyzed
Kruskal-Wallis test	
P value	0.0012
Exact or approximate P value?	Gaussian
P value summary	Approximation
Do the medians vary signif. (P < 0.05)	**
Number of groups	Yes
Kruskal-Wallis statistic	4
	15.88

Dunn's Multiple Comparison Test	Difference in rank sum	Significant? P < 0.05?	Summary
Kontrol vs 50%	-10.44	Yes	**
Kontrol vs 75%	-9.333	No	ns
Kontrol vs 100%	-16.00	No	ns
50% vs 75%	1.111	No	ns
50% vs 100%	-5.556	No	ns
75% vs 100%	-6.667	No	ns