# DAFTAR PUSTAKA


Abubakar, A. A., Okemwa, G. M., & Kimani, E. (2023). Comparative Assessment of the Impacts of Artisanal Trolling and Industrial Longlining on Yellowfin Tuna Exploited Off the Kenyan Coast. *Western Indian Ocean Journal of Marine Science*, *21*(2), 131–140. https://doi.org/10.4314/wiojms.v21i2.11

Afifi, M. A. M. (2022). First Record of Skipjack Tuna (Katsuwonus Pelamis) From Dahab in the Gulf of Aqaba, Red Sea, Egypt. *Egyptian Journal of Aquatic Biology and Fisheries*, *26*(3), 699–710. https://doi.org/10.21608/ejabf.2022.245659

al., I. I. e. (2022). Studying the Composition of Types and Productivity of Trap Net Fishing Equipment in the Coastal Waters of Pangkep Regency, South Sulawesi Indonesian. *Egyptian Journal of Aquatic Biology and Fisheries*, *26*(6), 1361–1374. https://doi.org/10.21608/ejabf.2022.298780

Arnenda, G. L., Akhbar, D., & Kusdinar, A. (2020). Faktor Operasional Yang Berpengaruh Terhadap Hasil Tangkapan Ikan Cakalang (Katsuwonus Pelamis ) Dan Madidihang (*Thunnus Albacares*) Di Perairan Bitung, Sulawesi Utara. *JFMR-Journal of Fisheries and Marine Research*, *4*(2), 201–206. https://doi.org/10.21776/ub.jfmr.2020.004.02.3

Badan Pusat Statistik Provinsi Sulawesi Barat. (2023). *Provinsi Sulawesi Barat Dalam Angka*. BPS.

Báez, J. C., Déniz, S., Ramos, M. L., Grande, M., Ruiz, J., Murua, H., Santiago, J., Justel-Rubio, A., Herrera, M., Moniz, I., López, J., Pascual-Alayón, P. J., Muniategi, A., Alzorriz, N., González-Carballo, M., Rojo, V., & Abascal, F. J. (2022). Data Provision for Science-Based FAD Fishery Management: Spanish FAD Management Plan as a Case Study. *Sustainability*, *14*(6), 3278. https://doi.org/10.3390/su14063278

Bahri, S., Simbolon, D., & Mustaruddin, M. (2017). Analisis Daerah Penangkapan Ikan Madidihang (*Thunnus Albacares*) Berdasarkan Suhu Permukaan Laut Dan Sebaran Klorofil-A Di Perairan Provinsi Aceh. *Jurnal Teknologi Perikanan Dan Kelautan*, *8*(1), 95–104. https://doi.org/10.24319/jtpk.8.95-104

Battaglia, P., Pedà, C., Malara, D., Milisenda, G., MacKenzie, B. R., Esposito, V., Consoli, P., Vicchio, T. M., Stipa, M. G., Pagano, L., Longo, F., & Romeo, T. (2022). Importance of the Lunar Cycle on Mesopelagic Foraging by Atlantic Bluefin Tuna in the Upwelling Area of the Strait of Messina (Central Mediterranean Sea). *Animals*, *12*(17), 2261. https://doi.org/10.3390/ani12172261

Bubun, R. L., & Mahmud, A. (2016). Komposisi Hasil Tangkapan Pukat Cincin Hubungannya Dengan Teknologi Penangkapan Ikan Ramah Lingkungan (Catch Composition Of Purse Seine In Relation To Environmental Friendly Fishing Technology). *Marine Fisheries : Journal of Marine Fisheries Technology and Management*, *6*(2), 177–186. https://doi.org/10.29244/jmf.6.2.177-186

Campello, T. H. P., Comassetto, L. E., Hazin, H. G., Santos, J. C. P. dos, Kerstetter, D. W., & Hazin, F. H. V. (2022). Comparative Analysis of Three Bait Types in Deep-Set Pelagic Longline Gear in the Equatorial Atlantic Ocean. *Boletim Do Instituto De Pesca*, *48*. https://doi.org/10.20950/1678-2305/bip.2022.48.e678

Capizzano, C. W., Mandelman, J. W., Hoffman, W. S., Dean, M. J., Zemeckis, D. R., Benoît, H. P., Kneebone, J., Jones, E. A., Stettner, M. J., Buchan, N. J., Langan, J. A., & Sulikowski, J. A. (2016). Estimating and Mitigating the Discard Mortality of Atlantic Cod (Gadus Morhua) in the Gulf of Maine Recreational Rod-and-Reel Fishery. *Ices Journal of Marine Science*, *73*(9), 2342–2355. https://doi.org/10.1093/icesjms/fsw058

Dinas Kelautan Dan Perikanan Provinsi Sulawesi Barat. (2021). *Statistik Perikanan Tuna Di Sulawesi Barat*.

Effendi M.I. (2002). *Biologi Perikanan* (Yayasan Pu).

Eisner, L. B., Gann, J. C., Ladd, C., Cieciel, K., & Mordy, C. W. (2016). Late Summer/Early Fall Phytoplankton Biomass (Chlorophyll A) in the Eastern Bering Sea: Spatial and Temporal Variations and Factors Affecting Chlorophyll a Concentrations. *Deep Sea Research Part Ii Topical Studies in Oceanography*, *134*, 100–114. https://doi.org/10.1016/j.dsr2.2015.07.012

Escalle, L., Gaertner, D., Chavance, P., Molina, A., Ariz, J., & Mérigot, B. (2016). Forecasted Consequences of Simulated FAD Moratoria in the Atlantic and Indian Oceans on Catches and Bycatches. *Ices Journal of Marine Science*, *74*(3), 780–792. https://doi.org/10.1093/icesjms/fsw187

Filous, A., Friedlander, A. M., Griffin, L. P., Lennox, R. J., Danylchuk, A. J., Mereb, G., & Golbuu, Y. (2020).

Movements of Juvenile Yellowfin Tuna (*Thunnus Albacares*) Within the Coastal FAD Network Adjacent to the Palau National Marine Sanctuary: Implications for Local Fisheries Development. *Fisheries Research*, *230*, 105688. https://doi.org/10.1016/j.fishres.2020.105688

Firdaus, M., Fauzi, A., & Falatehan, A. F. (2018). Deplesi Sumber Daya Ikan Tuna Dan Cakalang Di Indonesia. *Jurnal Sosial Ekonomi Kelautan Dan Perikanan*, *13*(2), 167–178.

Food and Agriculture Organization (FAO). (1995). *Code of Conduct for Responsible Fisheries*. Rome. 41 p.

Forrestal, F. C., Schirripa, M. J., Goodyear, C. P., Arrizabalaga, H., Babcock, E. A., Coelho, R., Ingram, W. W., Lauretta, M. V, Ortiz, M., Sharma, R., & Walter, J. F. (2019). Testing Robustness of CPUE Standardization and Inclusion of Environmental Variables With Simulated Longline Catch Datasets. *Fisheries Research*, *210*, 1–13. https://doi.org/10.1016/j.fishres.2018.09.025

Fuatkait, D. S., Matrutty, D. D. P., & Waileruny, W. (2022). Analisis Hasil Tangkapan Ikan Tuna Madidihang Berdasarkan Musim Di Perairan Kepulauan Tanimbar. *Triton Jurnal Manajemen Sumberdaya Perairan*, *18*(2), 84–94. https://doi.org/10.30598/tritonvol18issue2page84-94

Gaol, J. L., Leben, R. R., Vignudelli, S., Mahapatra, K., Okada, Y., Nababan, B., Mei-Ling, M., Amri, K., Arhatin, R. E., & Syahdan, M. (2015). Variability of Satellite-Derived Sea Surface Height Anomaly, and Its Relationship With Bigeye Tuna (<i>Thunnus Obesus</I>) Catch in the Eastern Indian Ocean. *European Journal of Remote Sensing*, *48*(1), 465–477. https://doi.org/10.5721/eujrs20154826

Griffiths, S. P., Allain, V., Hoyle, S., Lawson, T., & Nicol, S. (2018). Just a <scp>FAD</Scp>? Ecosystem Impacts of Tuna Purse-seine Fishing Associated With Fish Aggregating Devices in the Western Pacific Warm Pool Province. *Fisheries Oceanography*, *28*(1), 94–112. https://doi.org/10.1111/fog.12389

Hargiyatno, I. T., Anggawangsa, R. F., Natsir, M., Sedana, I. G. B., Widodo, A. A., & Wudianto, W. (2021). Comparison of Handline Tuna Catches in Indian Ocean and Banda Sea Waters. *E3s Web of Conferences*, *322*, 3004. https://doi.org/10.1051/e3sconf/202132203004

Haruna, H., Tupamahu, A., & Mallawa, A. (2019). Minimizing the Impact of Yellowfin Tuna *Thunnus albacares* fishing in Banda Sea. *International Journal of Environment, Agriculture and Biotechnology*, *4*(1), 99–104. https://doi.org/04. https://doi.org/10.22161/ijeab/4.1.16

Haruna, Mallawa, A., Musbir, & Zainuddin M. (2018). Population dynamic indicator of the yellowfin tuna (*thunnus albacares*) and its stock condition in the banda sea, indonesia. *AACL Bioflux*, *11*(4), 1323–1333.

Haruna, Tupamahu, A., Tawari, H. . R., Siahainenia, S. ., Trisnadhi, A., & Wamnebo, M. I. (2022). Eksplorasi Penangkapan Ikan dengan Pancing Ulur Tuna Madidihang Skala Kecil. *Jurnal Airaha*, *11*(02), 5–24.

Hutchinson, M., Itano, D., Muir, J. A., & Holland, K. N. (2015). Post-Release Survival of Juvenile Silky Sharks Captured in a Tropical Tuna Purse Seine Fishery. *Marine Ecology Progress Series*, *521*, 143–154. https://doi.org/10.3354/meps11073

Indra, I., Sinaga, P. A., Zulkarnain, & Safrida, S. (2022). The Sustainable Utilization of Skipjack Tuna in Northern Aceh Waters. *Iop Conference Series Earth and Environmental Science*, *951*(1), 12098. https://doi.org/10.1088/1755-1315/951/1/012098

Irham, M., Akbar, M. W., Mukhli, M., Fuadi, A., ND, M. A., & Setiawan, I. (2022). Catching Investigation of Yellowfin Tuna (<i>*Thunnus Albacares*</I>) Based on the Distribution of Chlorophyll-a in the North Waters of Aceh: A November and December Analysis. *E3s Web of Conferences*, *339*, 2004. https://doi.org/10.1051/e3sconf/202233902004

Jalil, M. B. A., Mallawa, A., Amir, F., & Safruddin, S. (2020). Size Composition and Length-Weight Relationships of the Yellowfin Tuna (<i>*Thunnus Albacares*</I>) in Bone Bay. *E3s Web of Conferences*, *153*, 1006. https://doi.org/10.1051/e3sconf/202015301006

Jatmiko, I., Rochman, F., & Agustina, M. (2018). Variasi Genetik Madidihang (*Thunnus Albacares*; Bonnaterre, 1788) Dengan Analisis Mikrosatelit Di Perairan Indonesia. *Jurnal Penelitian Perikanan Indonesia*, *24*(3), 157. https://doi.org/10.15578/jppi.24.3.2018.157-164

Kantun, W, & Faisal, A. (2013). Struktur Umur, Pola Pertumbuhan dan Mortalitas Tuna Madidihang *Thunnus albacares* (Bonnatere, 1788) Di Selat Makassar. *Jurnal Balik Diwa*, *4*(1), 8–14.

Kantun, W., A. Mallawa, & A. T. (2012). Dinamika Populasi tuna madidihang (*Thunnus albacares* di WPP

713 (Selat Makassar, Laut Flores, dan Teluk Bone). *Konferensi Naisonal VIII Pengelolaan Sumberdaya Pesisir Di Mataram*, 22-24 Oktober 2012.

Kantun, W & Mallawa, A. (2014). Respon Tuna Madidihang (*Thunnus albacares* terhadap Jenis umpan berbeda dan kedalaman pada perikanan Handline di Selat Makassar. *Journal of Fisheries Science*, *ISSN 0853*-.

Kantun, W & Mallawa, A. (2016). *Biologi Tuna Madidihang (Thunnus albacares)*. Gadjah Mada University Press.

Kantun W, Mallawa A, & R. N. (2014a). Perbandingan Struktur Ukuran Tuna Mandidihang (Thunnus albacores) yang Tertangkap pada Rumpon Laut Dalam dan Laut Dangkal di Perairan Selat Makassar. *Jurnal IPTEKS Pemanfaatan Sumberdaya Perikanan*, *1*(2), 112–128.

Kantun W, Mallawa A, & R. N. (2014b). Struktur Ukuran dan Jumlah Tangkapan Tuna Mandidihang (Thunnus Albacores) Menurut Waktu Penangkapan dan Kedalaman di Perairan Majene Selat Makassar. *Jurnal Saintek Perikanan*, *9*(2), 39–48.

Kantun, W., Ali, S. A., Mallawa, A. &, & Tuwo, A. (2011). Ukuran Pertama Kali Matang Gonad Dan Nisbah Kelamin Tuna Madidihang ( *Thunnus Albacares*) Di Perairan Majene-Selat Makassar Wayan Kantun 1 , Syamsu Alam Ali 2 , Achmar Malawa 2 dan Ambo Tuwo 2. *Jurnal Balik Diwa*, *2*(2), 1–6.

Kantun, W., Cahyono, I., & Arsana, W. S. (2019). Biological Aspect of Bullet Tuna <i>Auxis Rochei</I> (Risso, 1810) in the Makassar Strait, West Sulawesi, Indonesia. *Croatian Journal of Fisheries*, *77*(3), 119–126. https://doi.org/10.2478/cjf-2019-0013

Karyanto, K., Arifin, M. Z., & Katili, L. (2021). Teknik Pengoperasian Hand Line Tuna Dengan Metode Pemberat Batu Dan Minyak Cumi Di Perairan Laut Maluku. *Jurnal Bluefin Fisheries*, *2*(2), 1. https://doi.org/10.15578/jbf.v2i2.71

Karyanto, K., Reppie, E., & Budiman, J. (2015). Perbandingan Hasil Tangkapan Tuna Hand Line Dengan Teknik Pengoperasian Yang Berbeda Di Laut Maluku. *Jurnal Ilmu Dan Teknologi Perikanan Tangkap*, *1*(6). https://doi.org/10.35800/jitpt.1.6.2014.6960

Kementerian Kelautan dan Perikanan. (n.d.). *Satu Data KKP*. https://satudata.kkp.go.id/

Kleiven, P. J. N., Espeland, S. H., Olsen, E. M., Abesamis, R. A., Moland, E., & Kleiven, A. R. (2019). Fishing Pressure Impacts the Abundance Gradient of European Lobsters Across the Borders of a Newly Established Marine Protected Area. *Proceedings of the Royal Society B Biological Sciences*, *286*(1894), 20182455. https://doi.org/10.1098/rspb.2018.2455

Lewison, R. L., Crowder, L. B., Wallace, B. P., Moore, J. E., Cox, T., Žydelis, R., McDonald, S., DiMatteo, A., Dunn, D. C., Kot, C. Y., Bjorkland, R., Kelez, S., Soykan, C. U., Stewart, K. R., Sims, M., Boustany, A. M., Read, A. J., Halpin, P. N., Nichols, W. J., & Safina, C. (2014). Global Patterns of Marine Mammal, Seabird, and Sea Turtle Bycatch Reveal Taxa-Specific and Cumulative Megafauna Hotspots. *Proceedings of the National Academy of Sciences*, *111*(14), 5271–5276. https://doi.org/10.1073/pnas.1318960111

Liu, K.-M., Huang, L.-H., Su, K.-Y., & Joung, S.-J. (2021). Vulnerability Assessment of Pelagic Sharks in the Western North Pacific by Using an Integrated Ecological Risk Assessment. *Animals*, *11*(8), 2161. https://doi.org/10.3390/ani11082161

MacKenzie, B. R., Payne, M., Boje, J., Høyer, J. L., & Siegstad, H. (2014). A Cascade of Warming Impacts Brings Bluefin Tuna to Greenland Waters. *Global Change Biology*, *20*(8), 2484–2491. https://doi.org/10.1111/gcb.12597

Macusi, E. D., Abreo, N. A. S., & Babaran, R. P. (2017). Local Ecological Knowledge (LEK) on Fish Behavior Around Anchored FADs: The Case of Tuna Purse Seine and Ringnet Fishers From Southern Philippines. *Frontiers in Marine Science*, *4*. https://doi.org/10.3389/fmars.2017.00188

Matsumoto, T., Satoh, K., Semba, Y., & Toyonaga, M. (2016). Comparison of the Behavior of Skipjack (<i>Katsuwonus Pelamis</I>), Yellowfin (<i>*Thunnus Albacares*</I>) and Bigeye (<i>T. obesus</I>) Tuna Associated With Drifting <scp>FAD</Scp>s in the Equatorial Central Pacific Ocean. *Fisheries Oceanography*, *25*(6), 565–581. https://doi.org/10.1111/fog.12173

Muringai, R. T., Mafongoya, P., & Lottering, R. (2022). Climate Change Perceptions, Impacts and Adaptation Strategies: Insights of Fishers in Zambezi River Basin, Zimbabwe. *Sustainability*, *14*(6), 3456. https://doi.org/10.3390/su14063456

Nordlund, L. M., Unsworth, R. K. F., Gullström, M., & Cullen-Unsworth, L. C. (2017). Global Significance of

Seagrass Fishery Activity. *Fish and Fisheries*, *19*(3), 399–412. https://doi.org/10.1111/faf.12259

Nugroho, S. C., Jatmiko, I., & Wujdi, A. (2018). Pola Pertumbuhan Dan Faktor Kondisi Madidihang, *Thunnus Albacares* (Bonnaterre, 1788) Di Samudra Hindia Bagian Timur. *Jurnal Iktiologi Indonesia*, *18*(1), 13. https://doi.org/10.32491/jii.v18i1.371

NUR, M. (2023). Length-Weight Relationship and Condition Factor of Bullet Tuna (Auxis Rochei Risso, 1810) in the Waters of Mamuju District, West Sulawesi Province, Indonesia. *Biodiversitas Journal of Biological Diversity*, *24*(10). https://doi.org/10.13057/biodiv/d241005

Nurhayati, M., Wisudo, S. H., & Purwangka, F. (2018). Produktivitas dan Pola Musim Penangkapan Tuna Madidihang (*Thunnus albacares*) di Wilayah Pengelolaan Perikanan 573. *Akuatika Indonesia*, *3*(2), 127. https://doi.org/10.24198/jaki.v3i2.23400

Park, T. H., Lee, C. I., Kang, C.-K., Kwak, J. H., Lee, S.-H., & Park, H. J. (2019). Seasonal Variation in Food Web Structure and Fish Community Composition in the East/Japan Sea. *Estuaries and Coasts*, *43*(3), 615–629. https://doi.org/10.1007/s12237-019-00530-4

Pauly, D., & Zeller, D. (2017). Comments on FAOs State of World Fisheries and Aquaculture (SOFIA 2016). *Marine Policy*, *77(January*, 176–181. https://doi.org/https://doi.org/10.1016/j.marpol.2017.01 .006

Pérez, G., Dagorn, L., Deneubourg, J., Forget, F., Filmalter, J. D., Holland, K. N., Itano, D., Adam, S., Jauharee, R., Beeharry, S. S., & Capello, M. (2020). Effects of Habitat Modifications on the Movement Behavior of Animals: The Case Study of Fish Aggregating Devices (FADs) and Tropical Tunas. *Movement Ecology*, *8*(1). https://doi.org/10.1186/s40462-020-00230-w

Putri, A. R. S., Zainuddin, M., Musbir, M., Hidayat, R., & Mustapha, M. A. (2021). Mapping Potential Fishing Zones for Skipjack Tuna in the Southern Makassar Strait, Indonesia, Using Pelagic Habitat Index (PHI). *Biodiversitas Journal of Biological Diversity*, *22*(7). https://doi.org/10.13057/biodiv/d220758

Rahmah, A., Sahputri, J., Aprilla, M. R., Chaliluddin, M. A., & Elrahimi, A. S. (2022). Study of Determining the Fishing Season for Tiger Grouper (<i>Epinephelus Fuscoguttatus</I>) Landed at Kutaraja Fishing Port, Banda Aceh. *E3s Web of Conferences*, *339*, 4002. https://doi.org/10.1051/e3sconf/202233904002

Rais, M., Hamka, E., & Parisa, L. O. (2019). Distribusi Juvenil Tuna Berdasarkan Hasil Tangkapan Purse Seine Di Laut Banda. *Jurnal IPTEKS Pemanfaatan Sumberdaya Perikanan*, *6*(11), 102–113. https://doi.org/10.20956/jipsp.v6i11.6380

Ridwan, M., Kasmi, M., & Putri, A. R. S. (2019). Penentuan Komoditas Unggulan Perikanan Laut Kabupaten Polewali Mandar Berdasarkan Data Statistik Tahun 2016. *Jurnal Ipteks Pemanfaatan Sumberdaya Perikanan*, *5*(10). https://doi.org/10.20956/jipsp.v5i10.6203

Rodriguez-Tress, P., Capello, M., Forget, F., Soria, M., Beeharry, S. P., Dussooa, N., & Dagorn, L. (2017). Associative Behavior of Yellowfin *Thunnus Albacares*, Skipjack Katsuwonus Pelamis, and Bigeye Tuna T. Obesus at Anchored Fish Aggregating Devices (FADs) Off the Coast of Mauritius. *Marine Ecology Progress Series*, *570*, 213–222. https://doi.org/10.3354/meps12101

Sanchez, S., Tafforeau, P., Clack, J. A., & Ahlberg, P. (2016). Life History of the Stem Tetrapod Acanthostega Revealed by Synchrotron Microtomography. *Nature*, *537*(7620), 408–411. https://doi.org/10.1038/nature19354

Santoso, H., & Bawole, F. (2014). *Teknik pengoperasian alat tangkap purse seine pada kapal timur laut 00*. 1–58.

Saraux, C., Fromentin, J., Bigot, J.-L., Bourdeix, J.-H., Morfin, M., Roos, D., Beveren, E. V, & Bez, N. (2014). Spatial Structure and Distribution of Small Pelagic Fish in the Northwestern Mediterranean Sea. *Plos One*, *9*(11), e111211. https://doi.org/10.1371/journal.pone.0111211

Schiller, L., & Bailey, M. (2021). Rapidly Increasing Eco-certification Coverage Transforming Management of World's Tuna Fisheries. *Fish and Fisheries*, *22*(3), 592–604. https://doi.org/10.1111/faf.12539

Simanjuntak, D. H., Lumingas, L. J. L., & Sangari, J. R. R. (2019). Sustainable Potential of Tuna Fishery Around the Waters of North Sulawesi Province Based on Data From the Bitung Ocean Fisheries Port (PPS). *Jurnal Perikanan Dan Kelautan Tropis*, *10*(1), 18. https://doi.org/10.35800/jpkt.10.1.2019.24414

Sofiati, T & Alwi D. (2019). Produktivitas dan Pola Musim Penangkapan Ikan Tuna (*Thunnus albacares*) di Perairan Kabupaten Pulau Morotai. *Jurnal Ilmu Kelautan Kepulauan*, *2*(2), 84–91.

Suman, A., Irianto, H. E., Amri, K., Nugraha, B., & Bintoro, G. (2015). Population Structure And Bioreproduction Of Bigeye Tuna (Thunnus Obesus) In Western Part Of Sumatera And Southern Part Of Java And Nusa Tenggara, Indian Ocean. *Indonesian Fisheries Research Journal*, *21*(2), 109. https://doi.org/10.15578/ifrj.21.2.2015.109-116

Syamsuddin, M. L. (2023). Variation in Eastern Little Tuna (Euthynnus Affinis) Catches Related to El Niño Southern Oscillation (ENSO) Events in the Makassar Strait. *Iop Conference Series Earth and Environmental Science*, *1289*(1), 12007. https://doi.org/10.1088/1755-1315/1289/1/012007

Taher, H., Titaheluw, S. S., & Bafagih, A. (2018). Length-Weight Relationship and Stock Assessment of Tuna Fish (≪i>Euthynnus Affinis</I>) in East Halmahera Waters. *Akuatikisle Jurnal Akuakultur Pesisir Dan Pulau-Pulau Kecil*, *2*(2), 31–39. https://doi.org/10.29239/j.akuatikisle.2.2.31-39

Talahatu MF, Susiloningtyas D, Budiharsono S, & Handayani T. (2020). The utilization status of Yellowfin Tuna (*Thunnus albacares*) in Morotai Island Regency. *IOP Conf. Series: Earth and Environmental Science 429*. https://doi.org/doi:10.1088/1755-1315/429/1/012001

Tolotti, M. T., Guillotreau, P., Forget, F., Capello, M., & Dagorn, L. (2022). Unintended Effects of Single-Species Fisheries Management. *Environment Development and Sustainability*, *25*(9), 9227–9250. https://doi.org/10.1007/s10668-022-02432-1

Umar, M. T., Safruddin, S., & Zainuddin, M. (2019). Potencial Utilization of Skipjack Tuna (Katsuwonus Pelamis) in Bone Bay. *Torani Journal of Fisheries and Marine Science*, *2*(2). https://doi.org/10.35911/torani.v2i2.7053

Waileruny, W. (2024). Potensi Lestari Dan Status Pemanfaatan Ikan Tongkol (Auxis Thazard) Di Perairan Maluku Tengah. *Marine Fisheries Journal of Marine Fisheries Technology and Management*, *15*(1), 15–24. https://doi.org/10.29244/jmf.v15i1.48341

WCPFC. (2021). *Tuna Fishery Yearbook 2020*. *(Issue November)*. https://doi.org/https://doi.org/http://www.wcpfc.int

Weng, J.-S., Lee, M.-A., Liu, K., Hsu, M. H., Hung, M.-K., & Wu, L.-C. (2015). Feeding Ecology of Juvenile Yellowfin Tuna From Waters Southwest of Taiwan Inferred From Stomach Contents and Stable Isotope Analysis. *Marine and Coastal Fisheries*, *7*(1), 537–548. https://doi.org/10.1080/19425120.2015.1094157

Widodo, A. A., Mahulette, R. T., & Satria, F. (2015). Status Stok, Eksploitasi Dan Opsi Pengelolaan Sumberdaya Ikan Tuna Di Laut Banda. *Jurnal Kebijakan Perikanan Indonesia*, *7*(1), 45. https://doi.org/10.15578/jkpi.7.1.2015.45-54

Widodo, A. A., Wudianto, W., Sadiyah, L., Mahiswara, M., Proctor, C., & Cooper, S. D. (2020). Investigation On Tuna Fisheries Associated With Fish Aggregating Devices (Fads) In Indonesia Fma 572 And 573. *Indonesian Fisheries Research Journal*, *26*(2), 83. https://doi.org/10.15578/ifrj.26.2.2020.83-96

Wiryawan, B., Loneragan, N. R., Mardhiah, U., Kleinertz, S., Wahyuningrum, P. I., Pingkan, J., Wildan, Timur, P. S., Duggan, D., & Yulianto, I. (2020). Catch Per Unit Effort Dynamic of Yellowfin Tuna Related to Sea Surface Temperature and Chlorophyll in Southern Indonesia. *Fishes*, *5*(3), 28. https://doi.org/10.3390/fishes5030028

Zeller, D., Vianna, G. M. S., Ansell, M., Coulter, A., Derrick, B., Greer, K., Noël, S. L., Palomares, M. L. D., Zhu, A., & Pauly, D. (2021). Fishing Effort and Associated Catch Per Unit Effort for Small-Scale Fisheries in the Mozambique Channel Region: 1950–2016. *Frontiers in Marine Science*, *8*. https://doi.org/10.3389/fmars.2021.707999

Zudaire, I., Murua, H., Grande, M., Pernet, F., & Bodin, N. (2014). Accumulation and mobilization of lipids in relation to reproduction of yellowfin tuna (*Thunnus albacares*) in the Western Indian Ocean. *Fisheries Research*, *160*, 50–59. https://doi.org/https://doi.org/10.1016/j.fishres.2013.12.010

# LAMPIRAN

Lampiran 1. Perbandingan produksi dengan produksi estimasi

| Tahun | Produksi (Ton) | Upaya | Produksi Estimasi |
|---|---|---|---|
| 2007 | 18053 | 227 | 16408,4202 |
| 2008 | 24556 | 227 | 16427,5934 |
| 2009 | 20593 | 228 | 16440,3279 |
| 2010 | 20508 | 227 | 16411,6217 |
| 2011 | 13838 | 233 | 16635,8807 |
| 2012 | 5065 | 483 | 15558,5163 |
| 2013 | 6824 | 492 | 15140,318 |
| 2014 | 5500 | 486 | 15432,4416 |
| 2015 | 4036 | 494 | 15063,2131 |
| 2016 | 4383 | 514 | 14052,5106 |
| 2017 | 1478 | 511 | 14204,0795 |
| 2018 | 8852 | 598 | 8461,76146 |
| 2019 | 7699 | 592 | 8947,86119 |
| 2020 | 6408 | 810 | -15395,1647 |
| 2021 | 8008 | 637 | 5166,12194 |
| 2022 | 4887 | 829 | -18264,8012 |

Lampiran 2. Perhitungan MSY

| E | C |
|---|---|
| 0 | 0 |
| 5 | 535,308447 |
| 15 | 1582,43371 |
| 25 | 2598,23679 |
| 35 | 3582,7177 |
| 45 | 4535,87643 |
| 55 | 5457,71298 |
| 65 | 6348,22736 |
| 75 | 7207,41955 |
| 85 | 8035,28958 |
| 95 | 8831,83742 |
| 105 | 9597,06309 |
| 115 | 10330,9666 |
| 125 | 11033,5479 |
| 135 | 11704,807 |
| 145 | 12344,744 |
| 155 | **12953,3588** |
| 165 | 13530,6514 |
| 175 | 14076,6218 |
| 185 | 14591,2701 |
| 195 | 15074,5961 |
| 205 | **15526,6** |
| 215 | 15947,2817 |
| 225 | 16336,6413 |
| 235 | 16694,6787 |
| 245 | 17021,3938 |
| 255 | 17316,7869 |
| 265 | 17580,8577 |
| 275 | 17813,6064 |
| 285 | 18015,0328 |
| 295 | 18185,1371 |
| 305 | 18323,9193 |
| 315 | 18431,3792 |
| 325 | 18507,517 |
| 335 | 18552,3326 |
| 345 | 18565,826 |
| 355 | 18547,9972 |
| 365 | 18498,8463 |
| 375 | 18418,3732 |
| 385 | 18306,5779 |
| 395 | 18163,4604 |
| 405 | 17989,0208 |

| | |
|---|---|
| 415 | 17783,259 |
| 425 | 17546,175 |
| 435 | 17277,7688 |
| 445 | 16978,0405 |
| 455 | 16646,9899 |
| 465 | 16284,6172 |
| 475 | 15890,9224 |
| 485 | 15465,9053 |
| 495 | 15009,5661 |
| 505 | 14521,9046 |
| 515 | 14002,9211 |
| 525 | 13452,6153 |
| 535 | 12870,9873 |
| 545 | 12258,0372 |
| 555 | 11613,7649 |
| 565 | 10938,1705 |
| 575 | 10231,2538 |
| 585 | 9493,01497 |
| 595 | 8723,45397 |
| 605 | 7922,57078 |
| 615 | 7090,36542 |
| 625 | 6226,83789 |
| 635 | 5331,98817 |
| 645 | 4405,81628 |
| 655 | 3448,32222 |
| 665 | 2459,50597 |
| 675 | 1439,36755 |
| 685 | 387,90695 |
| 695 | -694,87583 |

| | |
|---|---|
| a | 107,8447438 |
| b | -0,156610885 |
| $a^2$ | 11630,48876 |
| 4*(-b) | 0,62644354 |
| C msy ($a^2$/4*(-b)) | 18565,90101 |
| E msy (a/(2*(-b)) | 344,3079 |
| TAC (80%MSY) | 14852,72081 |

| Tahun | Produksi (ton) | Tingkat Pemanfaatan (%) | Tingkat upaya Pemanfaatan (%) |
|---|---|---|---|
| 2007 | 18053 | 97,2 | 65,9 |
| 2008 | 24556 | 132,3 | 66,1 |
| 2009 | 20593 | 110,9 | 66,2 |
| 2010 | 20508 | 110,5 | 65,9 |
| 2011 | 13838 | 74,5 | 67,8 |
| 2012 | 5065 | 27,3 | 140,2 |
| 2013 | 6824 | 36,8 | 143,0 |
| 2014 | 5500 | 29,6 | 141,1 |
| 2015 | 4036 | 21,7 | 143,4 |
| 2016 | 4383 | 23,6 | 149,3 |
| 2017 | 1478 | 8,0 | 148,5 |
| 2018 | 8852 | 47,7 | 173,8 |
| 2019 | 7698,733 | 41,5 | 172,0 |
| 2020 | 6408,132 | 34,5 | 235,3 |
| 2021 | 8007,833 | 43,1 | 185,0 |
| 2022 | 4886,704 | 26,3 | 240,8 |
| | Rata-rata | 54,1 | 137,8 |

Lampiran 3. Hasil analisis hubungan Panjang-bobot ikan tuna

1. Musim Peralhan II (September-November)

| SUMMARY OUTPUT | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| *Regression Statistics* | | | | | | | | |
| Multiple R | 0,93526 | | | | | | | |
| R Square | 0,874712 | | | | | | | |
| Adjusted R Square | 0,87464 | | | | | | | |
| Standard Error | 11,98496 | | | | | | | |
| Observations | 1752 | | | | | | | |
| | | | | | | | | |
| ANOVA | | | | | | | | |
| | *df* | *SS* | *MS* | *F* | *gnificance F* | | | |
| Regression | 1 | 1754951 | 1754951 | 12217,77 | 0 | | | |
| Residual | 1750 | 251368,5 | 143,6392 | | | | | |
| Total | 1751 | 2006319 | | | | | | |
| | | | | | | | | |
| | *Coefficients* | *andard Err* | *t Stat* | *P-value* | *Lower 95%* | *Upper 95%* | *ower 95.0%* | *pper 95.0%* |
| Intercept | 47,12156 | 0,361099 | 130,4949 | 0 | 46,41333 | 47,82979 | 46,41333 | 47,82979 |
| X Variable 1 | 2,249813 | 0,020354 | 110,534 | 0 | 2,209892 | 2,289734 | 2,209892 | 2,289734 |

2. Musim Barat (Desember- Februari)

| SUMMARY OUTPUT | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| *Regression Statistics* | | | | | | | | |
| Multiple R | 0,954528 | | | | | | | |
| R Square | 0,911123 | | | | | | | |
| Adjusted I | 0,91046 | | | | | | | |
| Standard E | 14,03542 | | | | | | | |
| Observati | 136 | | | | | | | |
| | | | | | | | | |
| ANOVA | | | | | | | | |
| | *df* | *SS* | *MS* | *F* | *gnificance F* | | | |
| Regressio | 1 | 270611 | 270611 | 1373,709 | 2,67E-72 | | | |
| Residual | 134 | 26397,05 | 196,9929 | | | | | |
| Total | 135 | 297008 | | | | | | |
| | | | | | | | | |
| | *Coefficients* | *andard Err* | *t Stat* | *P-value* | *Lower 95%* | *Upper 95%* | *ower 95.0%* | *pper 95.0%* |
| Intercept | 23,87923 | 1,332341 | 17,92275 | 2,12E-37 | 21,24409 | 26,51436 | 21,24409 | 26,51436 |
| X Variable | 2,160301 | 0,058286 | 37,06359 | 2,67E-72 | 2,045021 | 2,275581 | 2,045021 | 2,275581 |

3. Musim Peralihan I (Maret- Mei)

| SUMMARY OUTPUT | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| *Regression Statistics* | | | | | | | | | |
| Multiple F | 0,920655 | | | | | | | | |
| R Square | 0,847605 | | | | | | | | |
| Adjusted I | 0,847221 | | | | | | | | |
| Standard E | 12,95834 | | | | | | | | |
| Observati | 399 | | | | | | | | |
| | | | | | | | | | |
| ANOVA | | | | | | | | | |
| | *df* | *SS* | *MS* | *F* | *gnificance F* | | | | |
| Regressio | 1 | 370776,5 | 370776,5 | 2208,073 | 2,9E-164 | | | | |
| Residual | 397 | 66663,68 | 167,9186 | | | | | | |
| Total | 398 | 437440,2 | | | | | | | |
| | | | | | | | | | |
| | *Coefficients* | *andard Err* | *t Stat* | *P-value* | *Lower 95%* | *Upper 95%* | *ower 95.0%* | *pper 95.0%* | |
| Intercept | 44,85778 | 1,295989 | 34,61276 | 5,9E-122 | 42,30992 | 47,40564 | 42,30992 | 47,40564 | |
| X Variable | 2,449615 | 0,05213 | 46,99014 | 2,9E-164 | 2,347129 | 2,552102 | 2,347129 | 2,552102 | |

4. Musim Timur (Juni – Agustus)

| SUMMARY OUTPUT | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| *Regression Statistics* | | | | | | | | | |
| Multiple R | 0,941487 | | | | | | | | |
| R Square | 0,886397 | | | | | | | | |
| Adjusted R Square | 0,88602 | | | | | | | | |
| Standard Error | 7,235329 | | | | | | | | |
| Observations | 303 | | | | | | | | |
| | | | | | | | | | |
| ANOVA | | | | | | | | | |
| | *df* | *SS* | *MS* | *F* | *gnificance F* | | | | |
| Regression | 1 | 122948,1 | 122948,1 | 2348,58 | 3,3E-144 | | | | |
| Residual | 301 | 15757,35 | 52,34998 | | | | | | |
| Total | 302 | 138705,5 | | | | | | | |
| | | | | | | | | | |
| | *Coefficients* | *andard Err* | *t Stat* | *P-value* | *Lower 95%* | *Upper 95%* | *ower 95.0%* | *pper 95.0%* | |
| Intercept | 68,25202 | 0,873226 | 78,1608 | 5,8E-202 | 66,53362 | 69,97042 | 66,53362 | 69,97042 | |
| X Variable 1 | 1,546588 | 0,031913 | 48,46215 | 3,3E-144 | 1,483787 | 1,609389 | 1,483787 | 1,609389 | |

Lampiran 4. Data Pengolahan CCRF Ramah Lingkungan

**Tabel 1. Kriteria Alat Tangkap ramah lingkungan berdasarkan CCRF 1995**

| NO | KRITERIA | SUB KRITERIA | SKOR |
|---|---|---|---|
| 1. | Selektivitas alat tangkap yang tinggi | Menangkap lebih dari 3 jenis ikan (ukuran berbeda jauh) | 1 |
| | | Menangkap 3 jenis ikan (ukuran berbeda jauh) | 2 |
| | | Menangkap kurang dari 3 jenis ikan (ukuran kurang lebih seragam) | 3 |
| | | Menangkap 1 jenis ikan (ukuran kurang lebih seragam) | 4 |
| 2. | Tidak merusak habitat ekosistem pesisir dan laut | Menyebabkan rusaknya habitat (wilayah kerusakan luas) | 1 |
| | | Menyebabkan rusaknya habitat (wilayah kerusakan sempit) | 2 |
| | | Menyebabkan rusaknya sebagian habitat (wilayah kerusakan sempit) | 3 |
| | | Tidak menyebabkan kerusakan habitat (aman) | 4 |
| 3. | Tidak berbahaya untuk nelayan | Dapat mengakibatkan kematian nelayan | 1 |
| | | Dapat mengakibatkan cacat permanen pada nelayan | 2 |
| | | Dapat mengakibatkan gangguan kesehatan (sifatnya sementara) | 3 |
| | | Aman untuk nelayan | 4 |
| 4. | Menghasilkan ikan yang berkualitas | Ikan kondisi mati dan busuk | 1 |
| | | Ikan kondisi mati, segar dan cacat fisik | 2 |
| | | Ikan kondisi mati dan segar | 3 |
| | | Ikan dalam keadaan hidup | 4 |
| 5. | Hasil produksi tidak membahayakan konsumen | Adanya peluang menyebabkan kematian konsumen | 1 |
| | | Peluang menyebabkan gangguan kesehatan konsumen | 2 |
| | | Sedikit membahayakan kesehatan konsumen | 3 |
| | | Tidak membahayakan konsumen (aman) | 4 |
| 6. | Tangkapan sampingan (HTS) | HTS terdiri dari beberapa jenis dan tidak laku dijual di pasar | 1 |
| | | HTS terdiri dari beberapa jenis dan ada yang laku dijual di pasar | 2 |
| | | HTS < 3 jenis dan laku dijual di pasar | 3 |
| | | HTS < 3 jenis dan mempunyai nilai jual tinggi di pasar | 4 |
| 7. | Dampak minimum terhadap biodiversitas | Dapat menyebabkan kematian semua organisme dan habitat | 1 |
| | | Dapat menyebabkan kematian beberapa jenis (merusak habitat) | 2 |
| | | Dapat menyebabkan kematian beberapa jenis (tidak merusak habitat) | 3 |
| | | Aman bagi biodiversitas perairan | 4 |
| 8. | Tidak menangkap jenis biota yang dilindungi/terancam punah | Biota dan ikan yang dilindungi sering tertangkap | 1 |
| | | Biota dan ikan yang dilindungi tertangkap beberapa kali | 2 |
| | | Biota dan ikan yang dilindungi pernah tertangkap | 3 |
| | | Biota dan ikan yang dilindungi tidak pernah tertangkap | 4 |
| 9. | Dapat diterima oleh nelayan/masyarakat | Biaya investasi relatif murah, | 1 |
| | | Usaha yang menguntungkan | 2 |
| | | Tidak bertentangan dengan budaya lokal | 3 |
| | | Tidak melanggar peraturan yang ada | 4 |

Hasil penilaian terhadap 9 kriteria berdasarkan sub kriteria pada Tabel 1 dijumlahkan secara total dari hasil hasil

Jumlah total dari 9 kriteria tersebut nantinya digunakan untuk pengambilan keputusan sejauh mana alat tangkap bagan perahu tersebut layak untuk dikembangkan secara keramahan lingkungannya. Ketentuan dalam pengambilan keputusan tersebut mengacu pada penilaian CCRF-FAO (1995) dalam Salim et al., (2019) dengan batasan nilai sebagai berikut:

Nilai 1-9 : sangat tidak ramah lingkungan

Nilai 10-18 : tidak ramah lingkungan

Nilai 19-27 : ramah lingkungan

Nilai 28-36 : sangat ramah lingkungan

**Tabel 2. Analisis kriteria Alat Tangkap ramah Lingkungan dari hasil wawancara dengan nelayan Purse Seine**

| Kode Responden | Kriteria Ramah Lingkungan | | | | | | | | | Bobot |
|---|---|---|---|---|---|---|---|---|---|---|
| | K1 | K2 | K3 | K4 | K5 | K6 | K7 | K8 | K9 | |
| R - A | 2 | 4 | 4 | 3 | 4 | 4 | 3 | 3 | 2 | 29 |
| R - B | 2 | 3 | 4 | 3 | 4 | 4 | 3 | 3 | 2 | 28 |
| R - C | 3 | 3 | 4 | 3 | 4 | 4 | 3 | 3 | 2 | 29 |
| R - D | 3 | 4 | 4 | 3 | 4 | 3 | 3 | 3 | 2 | 29 |
| R - E | 2 | 3 | 4 | 3 | 4 | 4 | 3 | 3 | 2 | 28 |
| R - F | 3 | 3 | 4 | 3 | 4 | 4 | 3 | 3 | 3 | 30 |
| R - G | 2 | 4 | 4 | 3 | 4 | 3 | 3 | 3 | 2 | 28 |
| R - H | 3 | 3 | 4 | 3 | 4 | 4 | 3 | 3 | 2 | 29 |
| R - I | 2 | 4 | 4 | 3 | 4 | 3 | 3 | 3 | 2 | 28 |
| R - J | 2 | 4 | 4 | 3 | 4 | 4 | 3 | 3 | 2 | 29 |
| **Rata - Rata Skoring** | 2 | 4 | 4 | 3 | 4 | 4 | 3 | 3 | 2 | 28,7 |

**Keterangan: K1 (selektivitas alat tangkap) K2 (tidak merusak habitat) K3 (tidak berbahaya bagi nelayan) K4 (ikan berkualitas) K5 (produk aman) K6 (hasil tangkap sampingan) K7 (dampak minim biodiversitas) K8 (tidak membahayakan spesies dilindungi) K9 (dapat diterima secara sosial)**

**Tabel 3. Analisis kriteria Alat Tangkap ramah Lingkungan dari hasil wawancara dengan nelayan hand line**

| Kode Responden | Kriteria Ramah Lingkungan | | | | | | | | | Bobot |
|---|---|---|---|---|---|---|---|---|---|---|
| | K1 | K2 | K3 | K4 | K5 | K6 | K7 | K8 | K9 | |
| R - A | 4 | 4 | 4 | 3 | 4 | 3 | 3 | 2 | 3 | 30 |
| R - B | 3 | 4 | 4 | 3 | 4 | 3 | 3 | 2 | 4 | 30 |
| R - C | 3 | 4 | 4 | 3 | 4 | 3 | 3 | 2 | 3 | 29 |
| R - D | 3 | 4 | 4 | 3 | 4 | 3 | 3 | 3 | 3 | 30 |
| R - E | 4 | 4 | 4 | 3 | 4 | 3 | 3 | 2 | 2 | 29 |
| R - F | 4 | 4 | 4 | 3 | 4 | 3 | 3 | 2 | 3 | 30 |
| R - G | 4 | 4 | 4 | 3 | 4 | 3 | 3 | 2 | 2 | 29 |
| R - H | 3 | 4 | 4 | 3 | 4 | 3 | 3 | 3 | 4 | 31 |
| R - I | 3 | 4 | 4 | 3 | 4 | 3 | 3 | 2 | 4 | 30 |
| R - J | 3 | 4 | 4 | 3 | 4 | 3 | 3 | 2 | 2 | 28 |
| **Rata - Rata Skoring** | | | | | | | | | | **29,6** |

**Keterangan: K1 (selektivitas alat tangkap) K2 (tidak merusak habitat) K3 (tidak berbahaya bagi nelayan) K4 (ikan berkualitas) K5 (produk aman) K6 (hasil tangkap sampingan) K7 (dampak minim biodiversitas) K8 (tidak membahayakan spesies dilindungi) K9 (dapat diterima secara sosial)**