

## DAFTAR PUSTAKA

- Abdurahiman, K. P., T. Harishnayak, P. U. Zacharia, & K. S. Mohamed. 2004. Length-weight relationship of commercially important marine fishes and shellfishes of the southern coast of the Karnataka, India. *NAGA*, WoldFish Center Quarterly, 27(1&2): 9-14.
- Ahyong, S. T., T. Y. Chan, & Y. C. Liao. 2008. A catalog of the mantis shrimp (Stomatopoda) of Taiwan. National Taiwan Ocean University. Keelung, 203 p. ISBN 978-986-01-5060-5.
- Akinwunmi, M. F., O. A. Bello-Olusoji, & H. E. Egwu. 2021. Bionomics of *Squilla mantis* (Linnaeus, 1758) from Makoko area of the Lagos Lagoon, Nigeria. *Advances in Food Sciences* 43 (2): 81-91.
- Ambarsari, N. 2016. Pengelolaan sumberdaya udang mantis (*Oratosquilla gravieri* Manning, 1978) di Teluk Palabuhanratu, Sukabumi, Jawa Barat. Thesis. Sekolah Pascasarjana IPB, Bogor.
- Arifandi, M. 2022. Pola pertumbuhan dan faktor kondisi udang mantis *Miyakella nepa* dan *Harpiosquilla harpax* di perairan Pulau Sakuala, Kabupaten Pangkajene dan Kepulauan. [Skripsi]. Fakultas Ilmu Kelautan dan Perikanan. Universitas Hasanuddin, Makassar.
- Arshad, A., T. Sofea, Z. Zamri, S. M. N. Amin, & R. Ara. 2015. Population dynamics of mantis shrimp, *Harpiosquilla harpax* in the coastal waters of Pantai Remis, Perak, Peninsular Malaysia. *Iranian Journal of Fisheries Sciences*, 14(1): 15-26.
- Aswady, T. U., Asriyana., & Halili. 2019. Rasio kelamin dan ukuran pertama kali matang gonad ikan kakatua (*Scarus rivulatus* Valenciennes, 1840) di perairan Desa Tanjung Tiram, Kecamatan Moramo Utara, Kabupaten Konawe Selatan. *Jurnal Manajemen Sumberdaya Perairan* 4 (2) : 183 – 190.
- Awadh, H., & M. Aksissou. 2020. Length-weight relationship of deep-water rose shrimp, *Parapenaeus longirostris* (Lucas, 1846) in the western Moroccan Mediterranean. *Egyptian Journal of Aquatic Biology & Fisheries*, 24(2): 405-416. ISSN 1110 – 6131.
- Ayodya, F. P., D. P. Wijayanti, & A. Sabdono. 2021. Lunar cycle and reproductive activity of redbelly yellowtail fusilier, *Caesio cuning* in Karimunjawa National Park, Indonesia. *Biodiversitas* 22(7):3075-3082.
- Chandra, T., G. Salim, & D. Wiharyant. 2015. Model populasi pendekatan pertumbuhan dan indeks kondisi *Harpiosquilla raphidea* waktu tangkapan pada pagi hari di perairan utara Pulau Tarakan. *Jurnal Harpodon Borneo*, 8(2): 122-131.
- Courtney, A. J., D. J. Die., & J. G. McGilvray. 1996. Lunar periodicity in catch rate and reproductive condition of adult eastern king prawns, *Penaeus plebejus*, in coastal waters of south-eastern Queensland, Australia. *Marine and Freshwater Research* 47(1): 67-76.

- Dimenta, R. H., R. Machrizal, Khairul., R. Hasibuan, A. Q. Manurung, & M. Ihsan. 2020. Biologi reproduksi udang mantis *Cloridopsis scorpio* di ekosistem mangrove Belawan, Sumatera Utara. *Depik Jurnal Ilmu-Ilmu Perairan, Pesisir dan Perikanan* 9(2):227-234.
- Dimenta, R.H., R. Machrizal, & Khairul. 2019. Informasi morfologi reproduksi dan nisbah kelamin udang mantis *Cloridopsis scorpio* (Latreille, 1828) di perairan ekosistem mangrove Belawan. *Jurnal Pembelajaran dan Biologi Nukleus*, 5 (2): 24-33. p-ISSN: 2442-9481, e-ISSN: 2685-7332.
- Dinh, Q. H., T. Duong, & N. Pham-Cam. 2021. A study of 1-benzyl-3-phenyl-2-thiourea as an effective steel corrosion inhibitor in 1.0 M HCl solution. *Journal of Chemistry*, 2021, 1–14. <https://doi.org/10.1155/2021/5519411>.
- Djuwito, S. W. Saputra, & W. A. Widyaningtiwi. 2013. Beberapa aspek biologi udang mantis (*Oratosquilla oratoria* De Haan, 1844) di perairan Cilacap, Jawa Tengah. *Journal of Management of Aquatic Resources* 2(3): 56-64.
- DKP. 2021. Laporan statistik perikanan Sulawesi Selatan 2020. [https://dkp.sulselprov.go.id/uploads/info/STATISTIK\\_2020.pdf](https://dkp.sulselprov.go.id/uploads/info/STATISTIK_2020.pdf)
- Effendie, M.I. 1979. Metode biologi perikanan. Yayasan Dewi Sri, Bogor. 112 hal.
- Ekalaturrahmah, Y. A. C., Zairion, & Y. Wardiatno. 2020. Population dynamics of mantis shrimp *Harpiosquilla harpax* and *Oratosquillina* sp. in the waters south of Madura Island, Indonesia. *Biodiversitas* 21(4):1458-1466.
- Froese, R. 2006. Cube law, condition factor and weight length relationship: history, meta-analysis and recommendations. *Journal of Applied Ichthyol*, 22: 241-253.
- Gökoğlu, M., Y. Kaya, M. C. Deval, & Z. Tosunoğlu. 2008. Some biological parameters of the Erythrean mantis shrimp, *Erugosquilla Massavensis* (Kossmann, 1880) (Stomatopoda, Squillidae) in the northeastern Mediterranean (Turkish waters). *Crustaceana* 81(1): 35-42.
- Gomes, I. D., & F. G. Araujo. 2004. Reproductive biology of two marine catfishes (Siluriformes, Ariidae) in the Sepetiba Bay Brazil. *Rev Biol. Trop.* 52:143-156.
- Ha-Kyong, C. 2022. Population dynamics of the Japanese mantis shrimp, *Oratosquilla oratoria* (De Haan, 1844) in the coastal area of Goheung, Korea. Dissertation, Master of Engineering, Pukyong National University.
- Hanif, M. A., M. A. Siddik, & M. M. Ali. 2020. Length-weight relationships of seven cyprinid fish species from the Kaptai Lake, Bangladesh. *Journal of Applied Ichthyology*, 36(2): 261-264.
- Hasan, M. R., M. Y. Hossain, Z. Mawa, & M. A. R. Hossain. 2022. Reproductive biology of *Heteropneustes fossilis* in a wetland ecosystem (Gajner Beel, Bangladesh) in relation to eco-climatic factors: suggesting a sustainable policy for aquaculture, management and conservation. *Saudi Journal of Biological Sciences*, 29 (2): 1160–1174.
- Hasan, M. R., M. Y. Hossain, Z. Mawa, S. Tanjin, M. A. Rahman, U. K. Sarkar, & J. Ohtomi. 2021. Evaluating the size at sexual maturity for 20 fish species

- (Actinopterygii) in wetland (Gajner Beel) ecosystem, north-western Bangladesh through multi-model approach: A key for sound management. *Acta. Ichthyol. Piscat* 51 (1): 29–36.
- Hasibuan, M. Z., & Khairul. 2021. Aspek biologi ikan duri (*Piicofillis dussumieri* Valenciennes, 1840). *Jurnal Pendidikan Biologi dan Sains*, 4(1): 18-24. e-ISSN : 2598-7453. DOI: <https://doi.org/10.31539/bioedusains.v4i1.2073>
- Hasibuan, S. A. D., & R. H. Dimenta. 2022. Aspek reproduksi udang mantis *Harpiosquilla raphidea* di ekosistem mangrove Kabupaten Labuhanbatu, Sumatera Utara. *Jurnal Biolokus: Jurnal Penelitian Pendidikan Biologi dan Biologi* 5 (1): 24-34.
- Hasnidar., A. Tamsil, Ernarningsih, Hasrun, & A. M. Akram. 2021. Biologi reproduksi ikan betok *Anabas testudineus* (Bloch 1792) di Danau Tempe Kabupaten Wajo Sulawesi Selatan. *Jurnal Iktiologi Indonesia* 22 (1): 17-34. DOI: <https://doi.org/10.32491/jii.v22i1.567>
- Hernández, P., T. McLellan-Clarke, C. Benavides-Varela, F. Villalobos-Rojas, J. Nivia-Ruiz, & I. Wehrtmann. 2011. Population demography and spatial distribution of the mantis shrimp *Squilla biformis* (Stomatopoda, Squillidae) from Pacific Costa Rica. *Marine Ecology Progress Series* 424:157-168.
- Hiransuchalert, R., C. Poarsa, T. Pongpeela, V. Yuvanatemiya, & B. Nuangsaeng. 2022. First description for ovarian maturation induction of female *Harpiosquilla raphidea* broodstock in individual containers within a recirculating aquaculture system. *Aquaculture Reports*, 27 (101364). DOI: <https://doi.org/10.1016/j.aqrep.2022.101364>
- Hossain, M. Y., M. A. Hossen, M. S. Islam, S. Jasmine, F. Nawar, & M. M. Rahman. 2017. Reproductive biology of *Pethia ticto* (Cyprinidae) from the Gorai River (SW Bangladesh). *J. Appl. Ichthyol.* 33, 1007–1014.
- Hossain, M. Y., M. A. S. Jewel, L. Nahar, M. M. Rahman, A. Naif, & J. Ohtomi. 2012. Gonadosomatic index-based size at first sexual maturity of the catfish *Eutropiichthys vacha* (Hamilton 1822) in the Ganges River (NW Bangladesh). *J. Appl. Ichthyol.* 28, 601–605.
- Ikegami, T., Y. Takeuchi, S. P. Hur, & A. Takemura. 2014. Impacts of moonlight on fish reproduction. *Marine Genomics* 14:59–66.
- James, D. B., & P. Thirumilu. 1993. Population dynamics of *Oratosquilla nepa* in the trawling grounds off Madras. *Journal of Marine Biological Association of India* 35 (1 &2): 135-140.
- Jiawei, X., S. Wenlu, D. Huichao, L. Chenyu, K. Senfan, M. Jingqiao, W. Gang, & S. Xiaotao. 2022. A detailed analysis of the effect of different environmental factors on fish phototactic behavior: directional fish guiding and expelling technique. *Animals* 12 (3): 240; <https://doi.org/10.3390/ani12030240>
- Kaisar, Nadiarti, M. T. Umar, Y. A. L. Nafie, D. Priosambodo, Irmawati, J. Tresnati, & Suwarni. 2021. Population dynamics of mantis shrimp (*Miyakea nepa* Fabricius, 1781) in Siwa, Bone Bay, South Sulawesi, Indonesia. *IOP Conference Series: Earth and Environmental Science* 763, 012037:1-5.

- Kampouris, T. E., E. Kouroupakis, M. Lazaridou, & I. E. Batjakas. 2018. Length-weight relationships of *Squilla mantis* (Linnaeus, 1758) (Crustacea, Stomatopoda, Squillidae) from Thermaikos Gulf, North-West Aegean Sea, Greece. *International Journal of Fisheries and Aquatic Studies*, 6(6): 241-246.
- Kennouche, H., & A. Kacimi. 2021. Growth estimation and length-weight relationships of spottail mantis shrimp (*Squilla mantis* Linnaeus, 1758) in the Algiers Region (south-west of Mediterranean Sea). *Applied Ecology and Environmental Research*, 19(6):5083-5101. ISSN 1589 1623. ISSN 1785 0037. DOI: [http://dx.doi.org/10.15666/aeer/1906\\_50835101](http://dx.doi.org/10.15666/aeer/1906_50835101).
- Keputusan Menteri Negara Lingkungan Hidup Nomor: 51 Tahun 2004 Tentang Baku Mutu Air Laut.
- Kesavan, S., J. S. Jenishma, T. Nirmal, S. S. Kamath, K. M. Xavier, T. P. Bhutia, & L. Shenoy. 2019. Length-weight relationship of three stomatopod species from the Mumbai coast, India. *Crustaceana*, 92(9), 1141–1149.
- Khademzadeh, O., & M. Haghi. 2017. Length-weight relationship and condition factor of white leg shrimp *Litopenaeus vannamei* (Boone, 1931) in culture systems of Choebdeh, West-South of Iran. *International Journal of Fisheries and Aquatic Studies*, 5(1): 298-301.
- Kim, S. E., H. Kim, H. Bae, H. G. Kim, & C. W. Oh. 2017. Growth and reproduction of the Japanese mantis shrimp, *Oratosquilla oratoria* (De Haan 1844) in the coastal area of Tongyeong, Korea. *Ocean Science Journal* 52(2):257–265.
- Kishor, C., O. R. Venkatappa, S. R. Nataraju, Somashekar, & R. Puneeth. 2023. Studies on length weight relationship and reproductive biology of *Miyakea nepa* (Latreille, 1828) from the trawl bycatches of Mangalore coast, Karnataka. *Journal of Experimental Zoology India* 26:1597-1602.
- Kodama, K., H. Shiraishi, M. Morita, & T. Horiguchi. 2009. Reproductive biology of the Japanese mantis shrimp *Oratosquilla oratoria* (Crustacea Stomatopoda): Annual cycle of gonadal development and copulation. *Marine Biology Research* 5(5):415–426.
- Kruse, M., M. Taylor, C. A. Muhando, & H. Reuter. 2016. Lunar, diel, and tidal changes in fish assemblages in an East African marine reserve. *Regional Studies in Marine Science* 3:49–57.
- Lee, L.Y., M. Nilamani, S. C. Wong, S. P. Woo, A. C. Shu-Chien, & A. Jaya-Ram. 2022. Preliminary observation of mantis shrimp breeding success in captivity. *Journal of Survey in Fisheries Sciences*, 9(1): 1-9.
- Lemos, D., & D. Weissman. 2020. Moulting in the grow-out of farmed shrimp: a review. *Reviews in Aquaculture*: 1-13.
- Manangkalangi, E., L. S. Syafei, I. Lapadi, P. T. Lefaan, N. Widiastuti, & M. F. Rahardjo. 2022. Biologi reproduksi ikan kiper, *Scatophagus argus* (Linnaeus, 1766) di Teluk Pabean, Indramayu . *Jurnal Sumberdaya Akuatik Indopasifik* 6 (3), 215–226. <https://doi.org/10.46252/jsai-fpik-unipa.2022.Vol.6.No.3.240>.

- Manning, R. B. 1998. Stomatopods. In: Carpenter K., Niem V., eds. The Living Marine Resources of the Western Central Pacific, Vol. 2: Cephalopods, crustaceans, holothurians and sharks. Italy: Food and Agriculture Organization of the United Nations (FAO), pp. 828-849.
- Maturbongs, M. R., S. Elviana, M. M. N. N. Lesik, C. Rani, & A. I. Burhanuddin. 2020. Growth patterns, sex ratio and size structure of nurseryfish (*Kurtus gulliveri* Castelnau, 1878) according to the lunar phase in Maro River, Merauke. AACL Bioflux 13(2):539-552.
- Mawa, Z., M. Y. Hossain, M. R. Hasan, S. Tanjin, M. A. Rahman, M. S. Sarmin, & K. A. Habib. 2021. First record on size at sexual maturity and optimum catchable length of 10 marine fishes from the Bay of Bengal (Bangladesh) through multi-models approach: a key for sound fisheries management. Environ. Sci. Pollut. Res. 28, 38117–38127.
- Mili, S., N. Bouriga, H. Missaoui, & O. Jarboui. 2011. Morphometric, reproductive parameters and seasonal variations in fatty acid composition of the mantis shrimp *Squilla mantis* (Crustacea: Stomatopoda) in the Gulf of Gabes (Tunisia). Journal of Life Sciences 5:1058-1071.
- Mili, S., O. Jarboui, & H. Missaoui. 2008. Caracteres biometriques de la squille *Squilla mantis* dans les eaux Tunisiennes. Bull. Inst. Natn. Scien. Tech. Mer de Salammbô 35: 1-14.
- Mili, S., R. Ennouri, O. Jarboui, & H. Missaoui. 2013. Distribution and abundance of the mantis shrimp *Squilla mantis* (Crustacea: Stomatopoda) in Tunisian waters: Gulfs of Tunis, Hammamet and Gabes. Greener Journal of Life Sciences 1(1):1-13.
- Mulyono, M., M. P. Patria, Abinawanto, R. Affandi, & F. A. Heriyansyah. 2016. Growth aspects of giant mantis shrimp *Harpiosquilla raphidea* Fabricius, 1798 in Banten Bay waters, Banten Province. International Journal of Marine Science 6(32):1-14.
- Mulyono, M., M. P. Patria, Abinawanto, R. Affandi, & Mardiyono. 2017. The development of gonad mantis shrimp *Harpiosquilla raphidea* Fabricius, 1798 in Banten Bay, Indonesia. International Journal of Aquatic Science, 8 (1): 26-33. ISSN: 2008-8019.
- Nurlia, 2022. Studi karakteristik morfometrik dan meristik udang mantis, *Miyakella nepa* Latreille, 1828 di Perairan pesisir Lantebung, Makassar, Sulawesi Selatan. [Skripsi]. Fakultas Ilmu Kelautan dan Perikanan. Universitas Hasanuddi, Makassar.
- Olamide, O. P. O., A. O. Adefemi, & B. O. A. Oluayo. 2014. Length-weight relationship and condition factor of shrimps in coastal waters of Ondo state, South West, Nigeria. International Journal of Fisheries and Aquatic Studies, 1(3): 137-142. ISSN: 2347-5129.
- Omar, S. B. A. 2016. Biologi Perikanan. Jurusan Perikanan, Fakultas Ilmu Kelautan dan Perikanan, Universitas Hasanuddin. Makassar.
- Omar, S. B. A., Kariyanti., D. Yanuarita, M. T. Umar, & Y. S. A Lawi. 2020. Length-weight relationship and condition factor of the Celebes rainbowfish

- Marosatherina ladigesii, endemic to the Maros karst region, South Sulawesi, Indonesia. *AACL Bioflux*, 13 (6): 3384-3396.
- Ouma, Y. O., C. O. Okuku, & E. N. Njau. 2020. Use of artificial neural networks and multiple linear regression model for the prediction of dissolved oxygen in rivers: case study of hydrographic basin of River Nyando, Kenya. *Complexity* (8): 1-23. DOI:[10.1155/2020/9570789](https://doi.org/10.1155/2020/9570789)
- Pavlov, D. A., N. G. Emel'yanova, L. T. B. Thuan, & V. T. T. Ha. 2014. Reproduction of freckled goatfish *Upeneus tragula* (Mullidae) in the coastal zone of Vietnam. *Journal of Ichthyology*. 54 (10): 893-904.
- Pratama, C., R. Hartati, & S. Redjeki. 2019. Biologi ikan kembung *Rastrelliger* sp. (Actinopterygii: Scombridae): ditinjau dari aspek panjang berat dan indeks kematangan gonad di perairan Semarang. *Journal of Marine Research* 8 (2) 189-196.
- Putra, D. F., M. Ulfa, S. Zahara, M. A. Abbas, M. Nasir, & N. Othman. 2020. Biological aspects of shrimps *Penaeus merguensis* and *Exopalaemon styliferus* in Nagan Raya coast, Aceh Province, Indonesia. *AACL Bioflux*, 13(5): 3068-3077.
- Ragonese, S., U. Morara, E. Canali, E. Pagliarino, & M. L. Bianchini. 2012. Abundance and biological traits of the spottail mantis shrimp, *Squilla mantis* (L., 1758) (Crustacea: Stomatopoda), off the southern coast of Sicily. *Cah. Biol. Mar.* 53: 485-493.
- Ramdhani, F., S. Heltria, E. R. E. Gelis, Nofrizal, R. Jhonnerie, & I. Zidni. 2023. Spatial distribution of mantis shrimp (*Harpisquilla raphidea*) in small-scale gillnet fishery: a case study in Kuala Tungkal, Tanjung Jabung Barat Regency, Jambi. *Jurnal Kelautan Tropis* 26 (1): 85-94. P-ISSN : 1410-8852, E-ISSN : 2528-3111.
- Rao, P. Y., D. R. Prasad, I. R. Sirisha, M. S. Rao, & G. Teja. 2015. Meat yield studies in *Harpisquilla harpax* (de Haan, 1844) and *Oratosquilla anomala* (Tweedie, 1935) (Crustacea: Stomatopoda) represented in the shrimp trawl net by-catches off Visakhapatnam, east coast of India. *European Journal of Experimental Biology*, 5(5):6-11.
- Ratnaningsih, S., Sulistiono, M. M. Kamal, D. M. Wildan, & A. Ervinia. 2021. Biologi reproduksi ikan belanak (*Planiliza subviridis*) yang tertangkap di perairan pantai Karangsang, Indramayu, Jawa Barat. *Jurnal Teknologi Perikanan dan Kelautan* 12 (1): 61-72.
- Ricker, W. E. 1975. Computation and interpretation of biological statistics of fish populations. *Bulletin of the Fisheries Research Board of Canada*, Bulletin 191, Ottawa. 401 pp. DOI: <https://waves-vagues.dfo-mpo.gc.ca/library-bibliotheque/1485.pdf>
- Rusaini, & L. Owens. 2019. The effect of viral infection on the relationship between the LOS cells and moulting stages of the black tiger prawn (*Penaeus monodon*). *AACL Bioflux* 12(4):1087-1101.
- Safi, A., M. A. Khan, M. U. A. Hashmi, & M. Z. Khan. 2014. Length-weight relationship and condition factor of striped piggy fish, *Pomadasystridens* (Forsskal,

- 1775) from Karachi Coast, Pakistan. *Journal of Entomology and Zoology Studies* , 2(5), 25–30.
- Sağlam, N. E., Y. D. Sağlam, & C. Sağlam. 2017. A study on some population parameters of mantis shrimp (*Squilla mantis* L., 1758) in Izmir Bay (Aegean Sea). *Journal of the Marine Biological Association of the United Kingdom*, 98(4):721–726.
- Salim, G., K. R. Handayani, S. Anggoro, A. Indarjo, A. D. Syakti, A. J. Ibrahim, J. Ransangan, & L. Y. Prakoso. 2020. Morphometric analysis of *Harpodon nehereus*, *Harpiosquilla raphidea*, and *Scylla serrata* in the coastal waters of Tarakan, North Kalimantan, Indonesia. *Biodiversitas* 21(10): 4829-4838.
- Sallam, W. S. 2005. Reproductive biology of the mantis shrimp *Erugosquilla Massavensis* from Port Said, Egypt. *Egypt Journal Aquatic Biology and Fish* 9 (1): 171-183.
- Samphan, P., & A. Ratanamusik. 2018. The length-weight relationship factor and sex-ratio of mantis shrimp (*Harpiosquilla* spp) in Andaman Sea of Satun Province, Thailand. *International Journal of Agricultural Technology* 14 (1): 61-71.
- Sawant, A. A., S. A. Ibrahım, S. Kesavan, S. Patil, & K. A. Xavier. 2019. Proximate composition of mantis shrimp resources available along Mumbai Waters. *Journal of Aquaculture in the Tropics* 34 (3-4): 251-258. <http://doi.org/10.32381/JAT.2019.34.3-4.11>
- Shima, J. S., C. W. Osenberg, S. H. Alonzo, E. G. Noonburg, P. Mitterwallner, & S. E. Swearer. 2020. Reproductive phenology across the lunar cycle: parental decisions, offspring responses, and consequences for reef fish. *Ecology* 101:1-13.
- Skewes T. D., C. R. Pitcher, & J. T. Trendal. 1994. Changes in the size structure, sex ratio and molting activity of a population of ornate rock lobsters, *Panulirus ornatus*, caused by an annual maturation molt and migration. *Bulletin of Marine Science* 54(1):38-48.
- Sudjana, N. 2005. *Metode statistika*. Bandung: Tarsito.
- Sukumaran, K. K. 1987. Study on the fishery and biology of the mantis shrimp *Oratosquilla nepa* (Latreille) of South Kanara Coast during 1979-83. *Indian Journal of Fisheries*, 34(3): 292-305.
- Suryanti, A., N. Riza, & T.S. Raza'i. 2018. Length-weight relationship and condition factor of white shrimp *Penaeus merguensis* captured in ecosystem mangrove of Bagan Asahan, Tanjungbalai, Asahan, North Sumatra, Indonesia. *IOP Conf. Series: Earth and Environmental Science* 122, 012108: 1-5.
- Takemura, A., M. S. Rahman, & Y. J. Park. 2010. External and internal controls of lunar-related reproductive rhythms in fishes. *Journal of Fish Biology* 76(1):7–26.
- Torcu-Koç, H., Z. Erdoğan, & C. Sarıgöl. 2023. A study on some population parameters of spot-tail mantis shrimp (*Squilla mantis* L.) (Crustacea:

- Stomatopoda) in Edremit Bay (Northern Aegean Sea). *Acta Biologica Turcica*, 36(2):1-9.
- Torres, M. A., F. Ramos, & I. Sobrino. 2012. Length-weight relationships of 76 fish species from the Gulf of Cadiz (SW Spain). *Fisheries Research*, 127–128, 171– 175. <https://doi.org/10.1016/j.fishres.2012.02.001>.
- Udoinyang, E. P., O. Amali, C. C. Iheukwumere, J. E. Ukpato. 2016. Length-weight relationship and condition factor of seven shrimp species in the artisanal shrimp fishery of Iko river estuary, southeastern Nigeria. *International Journal of Fisheries and Aquatic Studies*, 4(2): 109-114.
- Udupa, K. S. 1986. Statistical method of estimating the size at first maturity in fishes. *Fishbyte*, 4(2), 8–10.
- Vila, Y., I. Sobrino, & M. P. Jimenez. 2013. Fishery and life history of spot-tail mantis shrimp, *Squilla mantis* (Crustacea: Stomatopoda), in the Gulf of Cadiz (eastern central Atlantic). *Scientia Marina*, 77 (1) : 137-148. ISSN: 0214-8358.
- Wardiatno Y., & A. Mashar. 2013. Morphometric study of two Indonesian mantis shrimps (*Harpiosquilla raphidea* and *Oratosquillina gravieri*). *Buletin PSP*. 21(1):19-30.
- Wardiatno, Y., & A. Mashar. 2010. Biological information on the mantis shrimp, *Harpiosquilla raphidea* (Fabricius 1798) (Stomatopoda, Crustacea) in Indonesia with a highlight of its reproductive aspects. *Journal of Tropical Biology and Conservation*. 7:65-73.
- Wortham-Neal, J.L. 2002. Reproductive morphology and biology of male and female mantis shrimp (Stomatopoda: Squillidae). *Journal of Crustacean Biology*, 22(4): 728–74.
- Xue, Y., L. Guan, K. Tanaka, Z. Li, Y. Chen, & Y. Ren. 2017. Evaluating effects of rescaling and weighting data on habitat suitability modeling. *Fisheries Research* 188: 84–94. <http://dx.doi.org/10.1016/j.fishres.2016.12.001>
- Yang, B., & B. Herrmann. 2022. Simple and effective: T90 codends improve size selectivity and catch efficiency compared with diamond-mesh codends for mantis shrimp (*Oratosquilla oratoria*) in demersal trawl fishery of the South China Sea. *Frontiers in Marine Science* 9: 939269. doi: 10.3389/fmars.2022.939269.
- Yulistiani & R. H. Dimenta. 2022. Condition factors and growth patterns of mantis shrimp (*Harpiosquilla raphidea*) in the estuary waters of Berombang River. *Bioeduscience*. 6(2), 181- 197. doi: 10.22236/j.bes/629054.
- Yunlei, Z., Y. Huaming, Y. Haiqing, X. Binduo, Z. Chongliang, R. Yiping, X. Ying & X. Lili. 2020. Optimization of environmental variables in habitat suitability modeling for mantis shrimp *Oratosquilla oratoria* in the Haizhou Bay and adjacent waters. *Acta Oceanologica Sinica*, 12 p. doi: 10.1007/s13131-020-1546-8.
- Zakzok, S. M., A. G. A. El-ghany, A. Y. Anas , S. K. Dahshan , M. E. Rashad, M. Yasser, & M. M. Tawfik. 2022. Biometric study, sex ratio and potential biological activities of the edible mantis shrimp *Erugosquilla massavensis*.



Egyptian Journal of Aquatic Biology & Fisheries, 26(4): 229 – 253.  
DOI:[10.21608/EJABF.2022.249663](https://doi.org/10.21608/EJABF.2022.249663)

Zamri, Z., A. Arshad, S. M. N. Amin, M. A. Rahman, & J. A. A. Khayat. 2016. Sex ratio, gonad development and fecundity of *Miyakella nepa* (Crustacea, Stomatopoda) of Pantai Remis Coastal Waters of Malaysia. Journal of Environmental Biology, 37(4): 677-683.

**LAMPIRAN**

Lampiran 1. Analisis pola pertumbuhan *Miyakella nepa* jantan pada bulan gelap di Lantebung, Makassar

## Summary Output

<i>Regression Statistics</i>	
Multiple R	0,85883363
R Square	0,737595204
Adjusted R Square	0,735529025
Standard Error	0,064417603
Observations	129

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	1,481355041	1,481355041	356,9850568	1,04422E-38
Residual	127	0,527002704	0,004149628		
Total	128	2,008357746			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	-4,009111526	0,279732931	-14,3319255	2,61443E-28	-4,562652514	-3,455570538
X Variable 1	2,556631918	0,135314142	18,89404818	1,04422E-38	2,28886965	2,824394185

Lampiran 2. Analisis pola pertumbuhan *Miyakella nepa* betina pada bulan gelap di Lantebung, Makassar

## Summary Output

<i>Regression Statistics</i>	
Multiple R	0,86338352
R Square	0,745431103
Adjusted R Square	0,744252544
Standard Error	0,068683088
Observations	218

## ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	2,983702692	2,983702692	632,4932877	4,21023E-66
Residual	216	1,018951179	0,004717367		
Total	217	4,002653871			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	-3,938000147	0,210570384	-18,70158605	4,73185E-47	-4,353035946	-3,522964348
X Variable 1	2,522135743	0,100286043	25,14941923	4,21023E-66	2,324471202	2,719800283

Lampiran 3. Analisis statistik uji koefisien regresi *Miyakella nepa* jantan dan betina pada bulan gelap di Lantebung, Makassar

Jenis Kelamin	Nilai b	Nilai SE
Jantan (1)	2,5566	0,1353
Betina (2)	2,5221	0,1003

Langkah 1: Tentukan nilai  $(b_1 - b_2)$

$b_1$  = nilai b subtidal,  $b_2$  = nilai b intertidal

$$\begin{aligned}(b_1 - b_2) &= 2,5566 - 2,5221 \\ &= 0,0345\end{aligned}$$

Langkah 2: Tentukan nilai  $SE_{(b_1 + b_2)}$

$SE_{b_1}$  = Standard error subtidal;  $SE_{b_2}$  = Standard error intertidal

$$\begin{aligned}SE(b_1 - b_2) &= \sqrt{(SE_{b_1})^2 + (SE_{b_2})^2} \\ &= \sqrt{0,1353^2 + 0,1003^2} \\ &= 0,1684\end{aligned}$$

Langkah 3: Tentukan nilai  $t_{hitung}$

$$\begin{aligned}t_{hitung} &= \frac{(b_1 - b_2)}{SE(b_1 - b_2)} \\ &= 0,0345 / 0,1684 \\ &= 0,2049\end{aligned}$$

Langkah 4: Bandingkan nilai  $t_{hitung}$  dan  $t_{tabel}$

$$t_{hitung} = 0,2049$$

$$t_{tabel} / t_{0.05(343)} = 1,9669$$

Nilai  $t_{hitung} < t_{tabel}$ , maka pola pertumbuhan udang mantis jantan tidak berbeda nyata dengan pertumbuhan udang mantis betina pada bulan gelap.

Lampiran 4. Analisis pola pertumbuhan *Miyakella nepa* gabungan jantan dan betina pada bulan gelap di Lantebung, Makassar

## Summary Output

<i>Regression Statistics</i>	
Multiple R	0,873982369
R Square	0,763845181
Adjusted R Square	0,763160674
Standard Error	0,066944875
Observations	347

## ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	5,001062677	5,001062677	1115,906035	3,6921E-110
Residual	345	1,546157624	0,004481616		
Total	346	6,547220301			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	-3,957527411	0,158211461	-25,01416391	1,69186E-79	-4,268707823	-3,646346999
X Variable 1	2,531524985	0,075782409	33,40517976	3,6921E-110	2,382471301	2,68057867

Lampiran 5. Analisis pola pertumbuhan *Miyakella nepa* jantan pada bulan terang di Lantebung, Makassar

## Summary Output

<i>Regression Statistics</i>	
Multiple R	0,936346708
R Square	0,876745157
Adjusted R Square	0,876143914
Standard Error	0,057841754
Observations	207

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	4,878722825	4,878722825	1458,220645	3,81252E-95
Residual	205	0,685862035	0,003345668		
Total	206	5,564584861			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	4,846247993	0,161432334	-30,0203056	5,63157E-77	-5,164528547	-4,527967439
X Variable 1	2,963505557	0,07760579	38,18665532	3,81252E-95	2,81049771	3,116513405

Lampiran 6. Analisis pola pertumbuhan *Miyakella nepa* betina pada bulan terang di Lantebung, Makassar

## Summary Output

<i>Regression Statistics</i>	
Multiple R	0,960345736
R Square	0,922263932
Adjusted R Square	0,921988273
Standard Error	0,051268549
Observations	284

## ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	8,793946538	8,793946538	3345,659707	1,8692E-158
Residual	282	0,741226885	0,002628464		
Total	283	9,535173423			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	-4,8781217	0,108140758	-45,10900212	5,4911E-131	-5,090987256	-4,665256145
X Variable 1	2,975390592	0,051440254	57,84167794	1,8692E-158	2,874134984	3,0766462



Lampiran 7. Analisis statistik uji koefisien regresi *Miyakella nepa* jantan dan betina pada bulan terang di Lantebung, Makassar

Jenis Kelamin	Nilai b	Nilai SE
Jantan (1)	2,9635	0,0776
Betina (2)	2,9754	0,0514

Langkah 1: Tentukan nilai  $(b_1 - b_2)$

$b_1$  = nilai b subtidal,  $b_2$  = nilai b intertidal

$$\begin{aligned}(b_1 - b_2) &= 2,9635 - 2,9754 \\ &= -0,0119\end{aligned}$$

Langkah 2: Tentukan nilai  $SE_{(b_1 + b_2)}$

$SE_{b_1}$  = Standard error subtidal;  $SE_{b_2}$  = Standard error intertidal

$$\begin{aligned}SE(b_1 - b_2) &= \sqrt{(SE_{b_1})^2 + (SE_{b_2})^2} \\ &= \sqrt{0,0776^2 + 0,0514^2} \\ &= 0,0931\end{aligned}$$

Langkah 3: Tentukan nilai  $t_{hitung}$

$$\begin{aligned}t_{hitung} &= \frac{(b_1 - b_2)}{SE(b_1 - b_2)} \\ &= -0,0119 / 0,0931 \\ &= -0,1278\end{aligned}$$

Langkah 4: Bandingkan nilai  $t_{hitung}$  dan  $t_{tabel}$

$$t_{hitung} = -0,1278$$

$$t_{tabel} / t_{0.05(487)} = 1,9648$$

Nilai  $t_{hitung} < t_{tabel}$ , maka pola pertumbuhan udang mantis jantan tidak berbeda nyata dengan pertumbuhan udang mantis betina pada bulan terang.

Lampiran 8. Analisis pola pertumbuhan *Miyakella nepa* gabungan jantan dan betina pada bulan terang di Lantebung, Makassar

## Summary Output

<i>Regression Statistics</i>	
Multiple R	0,95266653
R Square	0,907573517
Adjusted R Square	0,907384506
Standard Error	0,054131967
Observations	491

## ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	14,07025151	14,07025151	4801,691406	5,1911E-255
Residual	489	1,432901951	0,00293027		
Total	490	15,50315346			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	-4,842040797	0,089391689	-54,16656576	9,1917E-209	-5,017680008	-4,666401586
X Variable 1	2,959587566	0,042710443	69,2942379	5,1911E-255	2,875668932	3,043506201

Lampiran 9. Uji *chi-square* nisbah kelamin berdasarkan tingkat kematangan gonad

### Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
JK * TKG	838	100.0%	0	.0%	838	100.0%

### JK \* TKG Crosstabulation

Count		TKG				Total
		TKG 1	TKG 2	TKG 3	TKG 4	
JK	BETINA	228	109	106	59	502
	JANTAN	125	98	106	7	336
Total		353	207	212	66	838

### Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	40.307 <sup>a</sup>	3	.000
Likelihood Ratio	44.832	3	.000
Linear-by-Linear Association	.010	1	.921
N of Valid Cases	838		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 26,46.

Lampiran 10. Uji *chi-square* nisbah kelamin berdasarkan waktu pengambilan sampel

### Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
BULAN * JK	838	100.0%	0	.0%	838	100.0%

### BULAN \* JK Crosstabulation

Count

		JK		Total
		BETINA	JANTAN	
BULAN	MEI	80	56	136
	JUNI	73	50	123
	JULI	71	49	120
	AGUSTUS	112	94	206
	SEPTEMBER	82	36	118
	OKTOBER	84	51	135
Total		502	336	838

### Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.555 <sup>a</sup>	5	.183
Likelihood Ratio	7.679	5	.175
Linear-by-Linear Association	1.054	1	.305
N of Valid Cases	838		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 47,31.

Lampiran 11. Uji chi-square nisbah kelamin berdasarkan fase bulan

**Case Processing Summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
JK * WAKTU	838	100.0%	0	.0%	838	100.0%

**JK \* WAKTU Crosstabulation**

Count

		WAKTU		Total
		BULAN TERANG	BULAN GELAP	
JK	BETINA	284	218	502
	JANTAN	207	129	336
Total		491	347	838

**Chi-Square Tests**

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2.102 <sup>a</sup>	1	.147		
Continuity Correction <sup>b</sup>	1.900	1	.168		
Likelihood Ratio	2.108	1	.147		
Fisher's Exact Test				.153	.084
Linear-by-Linear Association	2.099	1	.147		
N of Valid Cases <sup>b</sup>	838				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 139,13.

b. Computed only for a 2x2 table

Lampiran 12. Distribusi frekuensi panjang total dan tingkat kematangan gonad serta perhitungan pendugaan rata-rata panjang total pertama kali matang gonad *Miyakella nepa* jantan pada bulan gelap di Lantebung, Makassar

SK	Nt	Xi	Ni	Nb	Pi	Xi+1 - Xi = X	qi = 1-pi	(pi x qi)/ (ni-1)
83-90	87	1,9370	1	0	0,0000	0,0384	1,0000	0,0000
91-98	95	1,9754	9	0	0,0000	0,0353	1,0000	0,0000
99-106	103	2,0107	13	1	0,0769	0,0326	0,9231	0,0059
107-114	111	2,0434	27	2	0,0741	0,0304	0,9259	0,0026
115-122	119	2,0737	35	9	0,2571	0,0284	0,7429	0,0056
123-130	127	2,1021	31	17	0,5484	0,0266	0,4516	0,0083
131-138	135	2,1287	12	9	0,7500	0,0251	0,2500	0,0170
139-146	143	2,1538	1	1	1,0000	0,0000	0,0000	0,0000
Jumlah			129	39	2,7065	0,2168	5,2935	0,0395

$$m = X_k + \frac{x}{2} - (X \sum Pi)$$

$$= 2,1538 + (0,0251/2) - (0,0251 \times 2,7065)$$

$$= 2,1538 + 0,0126 - 0,0679$$

$$= 2,0985$$

$$M = \text{antilog } 2,0985$$

$$= 125,4585$$

$$M = \text{antilog} \left[ m \pm 1,96 \sqrt{X^2 \sum \frac{(p_1 - q_1)}{(n_1 - 1)}} \right]$$

$$M = \text{antilog} \left[ 2,0985 \pm 1,96 \sqrt{(0,0251^2) (0,0395)} \right]$$

$$M = \text{antilog} [2,0985 \pm 0,0098]$$

Jadi, batas bawah adalah

$$\text{Antilog} [2,0985 - 0,0098] = \text{antilog } 2,0887 = 122,6592$$

Sedangkan batas atas adalah

$$\text{Antilog} [2,0985 + 0,0098] = \text{antilog } 2,1083 = 128,3217$$

Sehingga panjang ukuran pertama kali udang mantis *Miyakella nepa* jantan pada bulan gelap matang gonad adalah 126 mm atau pada kisaran 123-128 mm.

Lampiran 13. Distribusi frekuensi panjang total dan tingkat kematangan gonad serta perhitungan pendugaan rata-rata panjang total pertama kali matang gonad *Miyakella nepa* betina pada bulan gelap di Lantebung, Makassar

SK	Nt	Xi	Ni	Nb	Pi	Xi+1 - Xi = X	qi = 1-pi	(pi x qi)/ (ni-1)
79-88	84	1,9217	1	0	0,0000	0,0491	1,0000	0,0000
89-98	94	1,9708	2	0	0,0000	0,0441	1,0000	0,0000
99-108	104	2,0149	8	0	0,0000	0,0401	1,0000	0,0000
109-118	114	2,0550	57	4	0,0702	0,0367	0,9298	0,0012
119-128	124	2,0917	55	9	0,1636	0,0338	0,8364	0,0025
129-138	134	2,1255	59	18	0,3051	0,0314	0,6949	0,0037
139-148	144	2,1569	28	10	0,3571	0,0293	0,6429	0,0085
149-158	154	2,1861	5	4	0,8000	0,0274	0,2000	0,0400
159-168	164	2,2135	2	1	0,5000	0,0258	0,5000	0,2500
169-178	174	2,2393	1	1	1,0000	0,0000	0,0000	0,0000
Jumlah			218	47	3,1960	0,3176	6,8040	0,3059

$$m = X_k + \frac{x}{2} - (X \sum P_i)$$

$$= 2,2393 + (0,0258/2) - (0,0258 \times 3,1960)$$

$$= 2,2393 + 0,0129 - 0,0825$$

$$= 2,1697$$



$$M = \text{antilog } 2,1697$$

$$= 147,8087$$

$$M = \text{antilog} \left[ m \pm 1,96 \sqrt{X^2 \sum \frac{(p_1 - q_1)}{(n_1 - 1)}} \right]$$

$$M = \text{antilog} \left[ 2,1697 \pm 1,96 \sqrt{(0,0258^2) (0,3059)} \right]$$

$$M = \text{antilog} [2,1697 \pm 0,0280]$$

Jadi, batas bawah adalah

$$\text{Antilog} [2,1697 - 0,0280] = \text{antilog } 2,1417 = 138,5798$$

Sedangkan batas atas adalah

$$\text{Antilog} [2,1697 + 0,0280] = \text{antilog } 2,1977 = 157,6522$$

Sehingga panjang ukuran pertama kali udang mantis *Miyakella nepa* betina pada bulan gelap matang gonad adalah 148 mm atau pada kisaran 139-158 mm.

Lampiran 14. Distribusi frekuensi panjang total dan tingkat kematangan gonad serta perhitungan pendugaan rata-rata panjang total pertama kali matang gonad *Miyakella nepa* jantan pada bulan terang di Lantebung, Makassar

SK	Nt	Xi	Ni	Nb	Pi	Xi+1 - Xi = X	qi = 1-pi	(pi x qi)/ (ni-1)
77-85	81	1,9085	5	0	0,0000	0,0458	1,00000	0,0000
86-94	90	1,9542	4	0	0,0000	0,0414	1,00000	0,0000
95-103	99	1,9956	14	0	0,0000	0,0378	1,00000	0,0000
104-112	108	2,0334	17	1	0,0588	0,0348	0,94118	0,0035
113-121	117	2,0682	60	11	0,1833	0,0322	0,81667	0,0025
122-130	126	2,1004	61	27	0,4426	0,0332	0,55738	0,0041
131-141	136	2,1335	35	22	0,6286	0,0308	0,37143	0,0069
142-150	146	2,1644	10	8	0,8000	0,0260	0,20000	0,0178
151-159	155	2,1903	1	1	1,0000	0,0000	0,00000	0,0000
Jumlah			207	70	3,1134	0,2818	5,8866	0,0348

$$m = X_k + \frac{x}{2} - (X \sum Pi)$$

$$= 2,1903 + (0,0260/2) - (0,0260 \times 3,1134)$$

$$= 2,1903 + 0,0130 - 0,0810$$

$$= 2,1223$$

$$M = \text{antilog } 2,1223$$

$$= 132,5257$$

$$M = \text{antilog} \left[ m \pm 1,96 \sqrt{X^2 \sum \frac{(p_1 - q_1)}{(n_1 - 1)}} \right]$$

$$M = \text{antilog} \left[ 2,1223 \pm 1,96 \sqrt{(0,0260^2) (0,0348)} \right]$$

$$M = \text{antilog} [2,1223 \pm 0,0095]$$

Jadi, batas bawah adalah

$$\text{Antilog} [2,1223 - 0,0095] = \text{antilog } 2,1128 = 129,6582$$

Sedangkan batas atas adalah

$$\text{Antilog} [2,1223 + 0,0095] = \text{antilog } 2,1318 = 135,4566$$

Sehingga panjang ukuran pertama kali udang mantis *Miyakella nepa* jantan pada bulan terang matang gonad adalah 133 mm atau pada kisaran 129-135 mm.

Lampiran 15. Distribusi frekuensi panjang total dan tingkat kematangan gonad serta perhitungan pendugaan rata-rata panjang total pertama kali matang gonad *Miyakella nepa* betina pada bulan terang di Lantebung, Makassar

SK	Nt	Xi	Ni	Nb	Pi	Xi+1 - Xi = X	qi = 1-pi	(pi x qi)/ (ni-1)
74-83	79	1,8949	4	0	0,0000	0,0521	1,0000	0,0000
84-93	89	1,9469	10	0	0,0000	0,0465	1,0000	0,0000
94-103	99	1,9934	13	0	0,0000	0,0420	1,0000	0,0000
104-113	109	2,0354	20	0	0,0000	0,0383	1,0000	0,0000
114-123	119	2,0737	54	1	0,0185	0,0352	0,9815	0,0003
124-133	129	2,1089	73	11	0,1507	0,0325	0,8493	0,0018
134-143	139	2,1414	75	32	0,4267	0,0303	0,5733	0,0033
144-153	149	2,1717	30	12	0,4000	0,0283	0,6000	0,0080
154-163	159	2,2000	4	2	0,5000	0,0266	0,5000	0,0833
164-173	169	2,2266	1	1	1,0000	0,0000	0,0000	0,0000
Jumlah			284	59	2,4959	0,3317	7,5041	0,0968

$$m = X_k + \frac{x}{2} - (X \sum P_i)$$

$$= 2,2266 + (0,0266/2) - (0,0266 \times 2,4959)$$

$$= 2,2266 + 0,0133 - 0,0664$$

$$= 2,1735$$

$$M = \text{antilog } 2,1735$$

$$= 149.1077$$

$$M = \text{antilog} \left[ m \pm 1,96 \sqrt{X^2 \sum \frac{(p_1 - q_1)}{(n_1 - 1)}} \right]$$

$$M = \text{antilog} \left[ 2,1735 \pm 1,96 \sqrt{(0,0266^2) (0,0968)} \right]$$

$$M = \text{antilog} [2,1735 \pm 0,0162]$$

Jadi, batas bawah adalah

$$\text{Antilog} [2,1735 - 0,0162] = \text{antilog } 2,1573 = 143,6481$$

Sedangkan batas atas adalah

$$\text{Antilog} [2,1735 + 0,0162] = \text{antilog } 2,0485 = 154,7747$$

Sehingga panjang ukuran pertama kali udang mantis *Miyakella nepa* betina pada bulan terang matang gonad adalah 149 mm atau pada kisaran 144-155 mm.

Lampiran 16. Pola pertumbuhan beberapa spesies udang mantis dari berbagai lokasi

Spesies	Lokasi	JK	n	a	b	R <sup>2</sup>	Pola pertumbuhan	Referensi
<i>Erugosquilla massavensis</i>	Laut Mediterranean Port Said (Mesir)	J	610	0,0245	2,716	0,878	Hipoalometrik	Zakzok et al. (2020)
		B	702	0,023	2,716	0,897	Hipoalometrik	
		G	1312	0,0231	2,726	0,884	Hipoalometrik	
<i>Harpiosquilla harpax</i>	Pantai Remis (Malaysia)	J	439	0,023	2,698	0,715	Hipoalometrik	Arshad et al. (2015)
		B	365	0,014	2,884	0,899	Hipoalometrik	
		G	804	0,015	2,852	0,841	Hipoalometrik	
	Pulau Madura	J	347	0,021	2,3057	0,8713	Hipoalometrik	Ekalaturrahmah et al. (2020)
		B	343	0,0163	2,4302	0,8251	Hipoalometrik	
<i>Harpiosquilla raphidea</i>	Pantai Mumbai (India)	J	54	0,000018	2,844	0,919	Hipoalometrik	Kesavan et al. (2019)
		B	46	0,000035	2,697	0,9612	Hipoalometrik	
		G	100	0,000027	2,758	0,9401	Hipoalometrik	
<i>Harpiosquilla spp</i>	Laut Andaman (Thailand)	J	265	0,0257	2,7425	0,8377	Hiperometrik	Samphan & Ratanamusik (2018)
		B	172	0,0610	2,4810	0,7239	Hiperometrik	
		G	437	0,0341	2,6564	0,8129	Hiperometrik	
<i>Miyakella nepa</i>	Lantebung, Makassar - bulan gelap	J	129	0,00010	2,5566	0,7376	Hiperometrik	Penelitian ini
		B	218	0,00012	2,5221	0,7454	Hiperometrik	
		G	347	0,00011	2,5315	0,7638	Hiperometrik	
	Lantebung, Makassar - bulan terang	J	207	0,00001	2,9635	0,8767	Isometrik	Penelitian ini
		B	284	0,00001	2,9754	0,9223	Isometrik	
		G	491	0,00001	2,9596	0,9076	Isometrik	
	Pantai Mumbai (India)	J	219	0,000008	3,055	0,9415	Isometrik	

		B	294	0,000004	3,214	0,9462	Hiperallometrik	Kesavan et al. (2019)
		G	513	0,000006	3,140	0,9401	Hiperallometrik	
	Pulau Sakuala, Makassar	J	54	0,0067	1,6785	0,7766	Hipoallometrik	Arifandi (2022)
		B	143	0,0004	2,2956	0,8282	Hipoallometrik	
		G	197	0,001	2,092	0,8028	Hipoallometrik	
<i>Oratosquilla perpensa</i>	Pantai Mumbai (India)	J	107	0,000014	2,941	0,9217	Hipoallometrik	Kesavan et al. (2019)
		B	101	0,000022	2,834	0,9391	Hipoallometrik	
		G	208	0,000018	2,891	0,9265	Hipoallometrik	
<i>Oratosquilla</i> sp	Pulau Madura	J	182	0,0405	2,3090	0,8428	Hipoallometrik	Ekalaturrahmah et al. (2020)
		B	230	0,0365	2,4970	0,8725	Hipoallometrik	
<i>Squilla mantis</i>	Teluk Edremit, Laut Aegean (Turki)	G	627	0,0106	2,9469	0,9218	Isometrik	Torcu-Koç et al. (2023)
	Teluk Izmir, Laut Aegean (Turki)	J	387	0,0111	2,95	0,91	Isometrik	Sağlam et al. (2017)
		B	549	0,0098	3,02	0,94	Isometrik	
		G	936	0,0098	3,0200	0,93	Isometrik	

Keterangan: JK = jenis kelamin, n = jumlah individu (ekor), a = *slope*, b = koefisien regresi, R<sup>2</sup> = koefisien determinasi, J = jantan, B = betina, G = gabungan jantan dan betina

Lampiran 17. Faktor kondisi beberapa spesies udang mantis dari berbagai lokasi

Spesies	Lokasi	Jenis kelamin	Faktor kondisi	Referensi
<i>Erugosquilla massavensis</i>	Laut Mediterranean Port Said (Mesir)	J	2,576	Zakzok et al. (2020)
		B	2,424	
		G	2,43	
<i>Harpiosquilla harpax</i>	Pantai Remis (Malaysia)	J	1,002-1,021	Arshad et al. (2015)
		B	1,010-1,025	
<i>Miyakella nepa</i>	Lantebung, Makassar - bulan gelap	J	1,0121±0,0254	Penelitian ini
		B	1,0133±0,0121	
		G	1,0124±0,0090	
	Lantebung, Makassar - bulan terang	J	1,0094±0,0103	Penelitian ini
		B	1,0072±0,0074	
		G	1,0081±0,0061	
	Pulau Sakula, Makassar	J	1,0216±0,0221	Arifandi (2022)
		B	0,9977±0,0110	
		G	1,0110-0,0110	
Pantai Remis (Malaysia)	J	1,00-1,05	Zamri et al. (2016)	
	B	1,00-1,02		

Keterangan: J = jantan, B = betina, G = gabungan jantan dan betina



Lampiran 18. Nisbah kelamin beberapa spesies udang mantis dari berbagai lokasi

Spesies	Lokasi	Jumlah individu (ekor)		Nisbah kelamin	Referensi
		Jantan	Betina	Jantan:Betina	
<i>Cloridopsis scorpio</i>	Belawan, Sumatera Utara	249	370	0,67:1,00	Dimenta et al. (2019)
<i>Erugosquilla</i>	Port Said (Mesir)	1023	974	1,05:1,00	Sallam (2005)
<i>massavensis</i>	Teluk Antalya (Turki)	138	133	1,04:1,00	Gökoğlu et al. (2008)
<i>Harpiosquilla harpax</i>	Visakhapatnam (India)	224	361	0,62:1,00	Rao et al. (2015)
	Teluk Banten	119	112	1,06:1,00	Mulyono et al. (2016)
	Pulau Madura	347	343	1,01:1,00	Ekalaturrahmah et al. (2020)
<i>Harpiosquilla raphidea</i>	Sungai Tungkal, Jambi	152	223	0,68:1,00	Wardiatno & Mashar (2010)
	Kuala Tungkal, Jambi	466	590	0,79:1,00	Wardiatno & Mashar (2013)
	Teluk Banten	186	146	1,27:1,00	Mulyono et al (2016)
	Labuhanbatu, Sumatera Utara	65	98	0,66:1,00	Hasibuan & Dimenta (2022)
<i>Harpiosquilla</i> spp	Laut Andaman (Thailand)	265	172	1,54:1,00	Samphan & Ratanamusik (2018)
<i>Miyakea nepa</i>	Teluk Banten	283	324	0,87:1,00	Mulyono et al. (2016)
	Teluk Bone, Sulawesi Selatan	533	467	1,14:1,00	Kaisar et al. (2021)
	Mangalore, Karnataka (India)	250	650	0,38:1,00	Kishor et al. (2023)
<i>Miyakella nepa</i>	Pantai Remis (Malaysia)	386	565	0,68:1,00	Zamri et al. (2016)
	Lantebung, Makassar	336	507	0,67:1,00	Penelitian ini
<i>Oratosquilla anomala</i>	Visakhapatnam (India)	370	333	1,11:1,00	Rao et al. (2015)
<i>Oratosquilla nepa</i>	Madras (India)	187	288	0,65:1,00	James & Thirumilu (1993)
	Karnataka (India)	107	109	0,98:1,00	Abdurahiman et al (2004)
<i>Oratosquilla oratoria</i>	Cilacap, Jawa Tengah	200	256	0,78:1,00	Djuwito et al. (2013)

	Tongyeong (Korea)	1241	1380	0,90:1,00	Kim et al. (2017)
	Goheung (Korea)	1521	1676	0,91:1,00	Ha-Kyong (2022)
<i>Oratosquillina gravieri</i>	Kuala Tungkal, Jambi	98	300	0,33:1,00	Wardiatno & Mashar (2013)
	Palabuhanratu, Jawa Barat	588	921	0,64:1,00	Ambarsari (2016)
<i>Oratosquillina</i> sp	Pulau Madura	182	230	0,79:1,00	Ekalaturrahmah et al (2020)
<i>Squilla mantis</i>	Gulf of Gabes (Tunisia)	8770	7799	1,12:1,00	Mili et al. (2008)
	Gulf of Hammamet (Tunisia)	1620	1404	1,15:1,00	Mili et al. (2008)
	Gulf of Tunis (Tunisia)	1726	1564	1,10:1,00	Mili et al. (2008)
	Pantai selatan Sicily (Italia)	207	277	0,75:1,00	Ragonese et al. (2012)
	Teluk Izmir, Laut Aegean (Turki)	387	549	0,70:1,00	Sağlam et al. (2017)
	Lagos Lagoon (Nigeria)	169	65	2,60:1,00	Akinwunmi et al. (2021)
	Laut Mediterranean	422	490	0,86:1,00	Kennouche & Kacimi (2021)
	Teluk Edremit Bay, Laut Aegean (Turki)	223	404	0,55:1,00	Torcu-Koç et al. (2023)

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Lampiran 19. Ukuran pertama kali matang gonad beberapa spesies udang mantis dari berbagai lokasi

Spesies	Lokasi	Ukuran pertama kali matang gonad (mm)		Referensi
		Jantan	Betina	
<i>Cloridopsis scorio</i>	Belawan, Sumatera Utara	205,5	186	Dimenta et al. (2020)
<i>Erugosquilla massavensis</i>	Port Said (Mesir)	-	125,1	Sallam (2005)
<i>Harpiosquilla raphidea</i>	Teluk Banten	230	199	Mulyono et al. (2017)
	Labuhanbatu, Sumatera Utara	198,8	187,5	Hasibuan & Dimenta (2022)
<i>Miyakea nepa</i>	Pantai Mangalore, Karnataka (India)	85	90	Kishor et al. (2023)
<i>Miyakella nepa</i>	Pantai Remis (Malaysia)	-	100	Zamri et al. (2016)
	Lantebung, Makassar – bulan gelap	125,46	147,81	Penelitian ini
	Lantebung, Makassar – bulan terang	132,53	149,11	Penelitian ini
<i>Oratosquilla nepa</i>	Madras (India)		73,2	James & Thirumilu (1993)
<i>Oratosquilla oratoria</i>	Teluk Tokyo (Jepang)	40-50	≥ 70	Kodama et al. (2009)
	Tongyeong (Korea)	-	96,5	Kim et al. (2017)
<i>Squilla mantis</i>	Gulf of Gabes (Tunisia)	-	147,19	Mili et al. (2011)