

DAFTAR PUSTAKA

- Akiyama, Dominy, Lawrence, 1992, Penaeid Shrimp Nutrition for the Commercial Feed Industry, Elsevier Science Publisher,
- Davis and Gatlin, 1996, Dietary mineral requirements of fish and marine crustaceans, The University of Texas, Austin.
<https://doi.org/10.1080/10641269609388579>
- Dey, Ghosh, Hazra, 2015, An Overview On Bioencapsulation Of Live Food Organisms With Probiotics For Better Growth And Survival Of Freshwater Fish Juveniles
- Ekawati, 2008, Peningkatan Sintasan Dan Pertumbuhan Kepiting Bakau (*Scylla Olivacea*) Stadia Zoea Melalui Aplikasi Pakan Alami Hasil Bioenkapsulasi Karotenoid Cangkang Kepiting Non Ekonomis
- Faidar, Budi, Indrawati, 2020, Analisis Pemberian Vitamin C Pada Rotifer Dan Artemia Terhadap Sintasan, Rasio Rna/Dna, Kecepatan Metamorphosis Dan Ketahanan Stres Larva Rajungan (*Portunus Pelagicus*) Stadia Zoea, Journal of Aquaculture and Environment, Makassar,
<https://doi.org/10.35965/jae.v2i2.345>
- Fujaya Y, Aslamsyah, Usman, 2011, Respon Molting, Pertumbuhan, dan Mortalitas Kepiting Bakau (*Scylla olivacea*) yang Disuplementasi Vitomolt melalui Injeksi dan Pakan Buatan, ILMU KELAUTAN: Indonesian Journal of Marine Sciences, <https://doi.org/10.14710/ik.ijsms.16.4.211-218>
- Gallagher and Brown, 1975, Composition of San Francisco Bay Brine Shrimp (*Artemia salina*), J. Agric. Food Chem., Vol. 23, No. 4.
- Gelabert, 2002, Bioencapsulation in Artemia: II. Influences of the particle concentration in the enrichment process, Universidad Auto´noma del Carmen, Mexico.
- Gunarto, 2016, Pemeliharaan larva kepiting bakau, *Scylla serrata* dengan pemberian pakan alami berbeda jenis pengayanya, Maros.
- Hamasaki, Suprayudi, Takeuchi, 2002, Mass mortality during metamorphosis to megalops in the seed production of mud crab *Scylla serrate* (Crustacea, Decapoda, Portunidae), Tokyo University of Fisheries, Japan.
<https://doi.org/10.1046/j.1444-2906.2002.00559.x>
- Hartanto, Nurcahyono, Sujaka, Usman, Buana, 2017, Produksi Benih Rajungan (*Portunus Pelagicus*), BPBAP Takalar, Takalar.
- Jantrarotai, Sirisintruwanich, Pripanapong, Chayarat, 2006, Morphological study in zoeal stages of mud crabs *Scylla serrata* (Herbst, 1796), Universitas Kasetsart, Bangkok.

- Joseph, 2003, Bioencapsulation of Live Feeds, Central Marine Fisheries Research Institute, India.
- Jusadi, Hasyim, Mokoginta, 2004, Pengaruh Artemia yang diperkaya dengan minyak ikan, minyak jagung dan minyak kelapa terhadap pertumbuhan dan volume otak larva Nila (*Oreochromis niloticus*), IPB, Bogor.
- Karim, 2003, Respon fisiologis larva kepiting bakau (*Scylla serrata*) yang diberi Nauplius Artemia hasil bioenkapsulasi dengan asam lemak -3 Hufa, Unhas, Makassar.
- Khasanah, Rahardja, Cahyoko, 2012 Pengaruh Pengkayaan Artemia Spp. Dengan Kombinasi Minyak Kedelai Dan Minyak Ikan Salmon Terhadap Pertumbuhan Dan Tingkat Kelangsungan Hidup Larva Kepiting Bakau (*Scylla Paramamosain*), Unair, Surabaya.
- Kucukgulmez, Celik, Yanar, Ersoy, Cikrikci, 2005, Proximate composition and mineral contents of the blue crab (*Callinectes sapidus*) breast meat, claw meat and hepatopancreas, Department of Fishing and Fish Processing Technology, Faculty of Fisheries, University of Cukurova, Adana, Turkey.
- Lall, S.P. 1989. The minerals. In: J.E. Halver (ed.). Fish nutrition. Second edition. Academic press. Inc. San Diego.
- Leger, 1987, The Nutrition value of Artemia : a review, Artemia research its Application, USA.
- Maisoni, 2017, Petunjuk Teknis Prosedur Produksi Biomas Artemia di Bak, BBPBAP Jepara, Jawa Tengah.
- Meyer, J.R., 2007. Morphogenesis. Department of Entomologi NC State University. USA.
- Mintarso, 2007, Evaluasi Pengaturan Waktu Peningkatan Salinitas pada Kualitas Produksi Kista Artemia, Undip, Jawa Tengah.
- Misbah, 2018. Kajian Kombinasi Salinitas dan Asam Amino Terlarut Pada Pemeliharaan Larva Kepiting Bakau (*Scylla tranquebarica* Fabricius, 1798). Universitas Hasanuddin.
- Mohapatra, Rautray, Patra, Vijayan, Mohanty, 2009, Elemental composition in mud crab *Scylla serrata* from Mahanadi estuary, India. <https://doi.org/10.1016/j.fct.2008.10.016>
- Nikhlani and Sukarti, 2017, Perkembangan Aktivitas Enzim Pencernaan Larva Rajungan (*Portunus pelagicus*), Jurnal Ilmu dan Teknologi Kelautan Tropis, Samarinda <http://dx.doi.org/10.29244/jitkt.v9i2.19280>
- Nikhlani and Sukarti, 2016, Morfologi Organ Dan Aktifitas Enzim Pencernaan Larva Rajungan (*Portunus pelagicus*), Jurnal Agrisistem, Universitas Mulawarman.

- Nurcahyono, 2019, Pembenihan Kepiting Bakau, BBPBAP Jepara, Jateng
- Nurlaela, Niswar, Nurtanio, Fujaya, Kashihara, 2019, Deteksi Larva Kepiting Fase Megalopa menggunakan Pemrosesan Gambar Digital, ISRITI, Sulawesi Selatan.
- Okafor, Umenne, Tabugbo, Okonkwo, 2020, Potentiality of Diethylamine as Agent of Deproteinization and Deacetylation in the Extraction of Chitosan from *Scylla serrata* Shell, Nigeria.
- Ong, Fotedar, Ho, 2018, Effects of Extended-Rotifers Inclusion and Live Food Enrichment with Probiotics on the Survival, Metamorphosis, Development Time and Growth of Mud Crab, *Scylla paramamosain* (Estampador) Larvae, Curtin University, Australia.
- Paran, Jeyagobi, Kizhakedath, Antony, Francis, 2022, Production of juvenile mud crab, *Scylla serrata* : Captive breeding, larviculture and nursery production, Elsevier <https://doi.org/10.1016/j.aqrep.2021.101003>
- Pattirane dan Pattiasina, 2020, Ciri morfologi, pertumbuhan serta tingkat kelangsungan hidup larva tahap awal kepiting bakau (*Scylla serrata*) selama masa pemeliharaan, Universitas Pattimura.
- Permadi, Pratama, Suryaningtyas, Jasmadi, 2020, Effect of calcium and enzyme involvement to survival rate and development of the early stage zoea *Portunus pelagicus*, Pusat penelitian Oseanografi-LIPI. Doi: 10.1088/1755-1315/530/1/012002
- Prastyanti, Abrina, Sunarto, Andriani, 2017, Kelangsungan Hidup Dan Pertumbuhan Larva Rajungan (*Portunus Pelagicus*) Melalui Pemberian Nauplius Artemia Yang Diperkaya Dengan Minyak Ikan Dan Minyak Jagung, Universitas Padjadjaran, Jawa Barat.
- Pratama, Juwana, Permadi, 2016, Penetapan Kadar Kalsium dalam Pakan Formulasi untuk Zoea Awal Kepiting *Scylla paramamosain*, LIPI.
- Pratoomchat, Sawangwong, Guedes, Ries, Machado, 2002, Cuticle Ultrastructure Changes in the Crab *Scylla serrata* Over the Molt Cycle, Department of Aquatic Science, Thailand.
- Reaka, 1975, Molting in Stomatopod Crustaceans, University of California, California.
- Sari, Risjani, Marhendra, 2012, Histologi Organ Hepatopankreas Kepiting Bakau (*Scylla serata*) pada Konsentrasi Sublethal Fenol sebagai Peringatan Dini (Early warning) Toksisitas Fenol di Estuaria, Unibraw, Malang.
- Suprayudi, Takeuchi, Hamasaki, 2004, Effects of Artemia enriched with EPA and DHA on survival and occurrence of molting failure in megalop larvae of the mud crab *Scylla serrata*, Tokyo University, Jepang.

- Susanto, Setyadi, Syahidah, Marzuqi, Rusdi, 2005, Penggunaan Bakteri Probiotik Sebagai Kontrol Biologi Dalam Produksi Massal Benih Rajungan (*Portunus Pelagicus*), BBRPBL Gondol, Bali.
- Suyanto, Rahman, Murwantoko 2019, Pengaruh Pakan Bioenkapsulasi *Artemia Salina* Dengan *Spirulina Platensis* Terhadap Tingkat Kelangsungan Hidup Benih Ikan Nila (*Oreochromis Niloticus*). <https://doi.org/10.21776/ub.biotropika.2019.007.02.5>
- Swasthikawati, Pratiwi, Trijoko, 2014, Total Fat, Calcium (Ca), Iron (Fe) and Zinc (Zn) Contents During Ecdysis process in the Crabs (*Scylla serrata*, Forsskal), UGM, Yogyakarta <https://doi.org/10.22146/jsv.6559>
- Thirunavukktasu, Nesakumari, Shanmugam, 2014, Larval rearing and seed production of mud crab *Scylla tranquebarica* (Fabricius, 1798), Department of Advanced Zoology and Biotechnology, India.
- Tocher, Mourente, Sargent, 1997, The Use of Silage From Fish Neural Tissue as Enricher For Rotifer and Artemia in The Nutrition of Larval Marine Fish, Aquaculture. [https://doi.org/10.1016/S0044-8486\(96\)01396-8](https://doi.org/10.1016/S0044-8486(96)01396-8)
- Usman, Permana, Ardinsyah, Wulandari, Purwanti, Setyaningrum, Lastari, Artemisia, 2022, Calcium Extract Characterization from Rajungan Crab Shell (*Portunus pelagicus*) and Bakau Crab Shell (*Scylla serrata*) using Calcination as Effervescent, Jurnal Akademika Kimia.
- Wahyudi, Mewo, Ganda, 2018, Perangkat Visualisasi Metamorfosis Kupu-kupu Menggunakan Animated Augmented Reality, Jurnal Ilmiah SISFOTENIKA.
- Wang, Wu, Liu, Zheng, Cheng, 2014, Insights into Hepatopancreatic Functions for Nutrition Metabolism and Ovarian Development in the Crab *Portunus trituberculatus*: Gene Discovery in the Comparative Transcriptome of Different Hepatopancreas Stages, Shanghai Ocean University, China.
- Wheatly, 1999, Calcium Homeostasis in Crustacea: The Evolving Role of Branchial, Renal, Digestive and Hypodermal Epithelia, Department of Biological Sciences, Wright State University, Dayton [https://doi.org/10.1002/\(SICI\)1097-010X\(19990601\)283:7%3C620::AID-JEZ2%3E3.0.CO;2-3](https://doi.org/10.1002/(SICI)1097-010X(19990601)283:7%3C620::AID-JEZ2%3E3.0.CO;2-3)
- Zainuddin, 2012, Efek Kalsium Fosfor dengan Rasio Berbeda terhadap Retensi Nutrient dan Perubahan Komposisi Kimia Tubuh juvenile Udang Windu, Jurnal Ilmu dan Teknologi Kelautan Tropis, Makassar.
- Zanotto, Pinheiro and Sa 2004, The importance of dietary calcium consumption in two species of semi-terrestrial grapsoid crabs, Universidade Presbiteriana Mackenzie, Brazil. <https://doi.org/10.1590/S0073-47212009000300011>

LAMPIRAN

Lampiran 1. Dokumentasi Kegiatan Penelitian



Limbah Cangkang Rajungan



Pencucian



Penjemuran



Pemecahan/Penghalusan



Penimbangan



Calsium dari Cangkang Rajungan



Bak Penelitian



Bioenkapsulasi Artemia



pH & Suhu



Refraktometer



Pengitungan larva



Pengamatan mikroskopis



Pengitungan Panjang Megalopa



Pengitungan Panjang Megalopa

Lampiran 2. Data Hasil Penelitian

PANJANG MEGALOPA RAJUNGAN

Perlakuan	Panjang Akhir (D12)	Panjang awal (D13)	Growth	Average
A1	1,52	0,88	0,64	0,53
A2	1,25	0,98	0,27	
A3	1,5	0,83	0,67	
B1	1,42	0,84	0,58	0,53
B1	1,56	1,13	0,43	
B3	1,69	1,11	0,58	
C1	1,78	0,99	0,79	0,62
C2	1,77	1,08	0,69	
C3	1,64	1,26	0,38	
D1	1,8	1,05	0,86	0,75
D2	1,77	0,92	0,85	
D3	1,8	1,35	0,53	

*Panjang tubuh keseluruhan

DATA SR MEGALOPA RAJUNGAN

Perlakuan	Tebar Zoea	Hidup Megalopa	SR (%)	Average
A1	2000	203	10,15	13,30
A2	2000	266	13,30	
A3	2000	329	16,45	
B1	2000	287	14,35	13,18
B1	2000	231	11,55	
B3	2000	273	13,65	
C1	2000	245	12,25	14,93
C2	2000	385	19,25	
C3	2000	266	13,30	
D1	2000	301	15,03	15,98
D2	2000	385	19,25	
D3	2000	273	13,65	

GROWTH DAN SR HASIL PENELITIAN

Perlakuan	Simbol	SR (%)	Growth (mm)
0 ppm	A1	10,15	0,64
	A2	13,30	0,27
	A3	16,45	0,67
30 ppm	B1	14,35	0,58
	B1	11,55	0,43
	B3	13,65	0,58
40 ppm	C1	12,25	0,79
	C2	19,25	0,69
	C3	13,30	0,38
50 ppm	D1	15,40	0,86
	D2	19,25	0,85
	D3	13,30	0,54

Lampiran 3. Data Hasil Analisis Bahan



**LABORATORIUM KIMIA PAKAN
JURUSAN NUTRISI DAN MAKANAN TERNAK
FAKULTAS PETERNAKAN
UNIVERSITAS HASANUDDIN**

HASIL ANALISIS BAHAN

No	Kode Sampel	Kadar Calsium (%)
1	Cangkang Kepiting	59,84

Makassar, 2 Oktober 2023

Analisis



Muhammad Syahrul

Nip. 19790603 2001 12 1 001



**LABORATORIUM KIMIA PAKAN
JURUSAN NUTRISI DAN MAKANAN TERNAK
FAKULTAS PETERNAKAN
UNIVERSITAS HASANUDDIN**

HASIL ANALISIS BAHAN ARTEMIA (KERING)

No	Perlakuan	KOMPOSISI (%)				Kalsium (%)
		Protein Kasar	Lemak Kasar	Karbohidrat	Abu	
1	0 ppm	49.103	6.502	10.314	34.081	0.020
2	30 ppm	38.695	6.985	20.956	33.364	0.032
3	40 ppm	55.846	5.473	12.313	26.368	0.033
4	50 ppm	59.357	6.140	10.916	23.587	0.036



Makassar, 28 Februari 2024

Analisis

Muhammad Syahrul

NIP. 19790603 2001 12 1 001



**LABORATORIUM KIMIA PAKAN
JURUSAN NUTRISI DAN MAKANAN TERNAK
FAKULTAS PETERNAKAN
UNIVERSITAS HASANUDDIN**

HASIL ANALISIS MEGALOPA RAJUNGAN (BASAH)

No	Kode Sampel	Kalsium (%)
1	A1	0.199
2	A2	0.104
3	A3	0.181
4	B1	0.083
5	B2	0.138
6	B3	0.180
7	C1	0.087
8	C2	0.097
9	C3	0.103
10	D1	0.096
11	D2	0.118
12	D3	0.078



Makassar, 28 Februari 2024

Analisis

Muhammad Syahrul

NIP. 19790603 2001 12 1 001

Lampiran 4. Uji Statistik

CA MENGALOPA**Descriptives**

Ca_Megalopa

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
0 ppm	3	.1613	.05046	.02913	.0360	.2867	.10	.20
30 ppm	3	.1333	.04817	.02781	.0137	.2530	.08	.18
40 ppm	3	.0953	.00862	.00498	.0739	.1168	.09	.10
50 ppm	3	.0973	.02003	.01157	.0476	.1471	.08	.12
Total	12	.1218	.04229	.01221	.0950	.1487	.08	.20

ANOVA

Ca_Megalopa

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.009	3	.003	2.242	.161
Within Groups	.011	8	.001		
Total	.020	11			

Perlakuan	Kalsium (%) (Rata-rata $\pm$ SD)
0 ppm	0,161 $\pm$ 0,050 ^a
30 ppm	0,134 $\pm$ 0,048 ^a
40 ppm	0,095 $\pm$ 0,008 ^a
50 ppm	0,098 $\pm$ 0,020 ^a

SR

Descriptives

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
0 ppm	3	13.3000	3.15000	1.81865	5.4750	21.1250	10.15	16.45
30 ppm	3	13.1833	1.45717	.84130	9.5635	16.8031	11.55	14.35
40 ppm	3	14.9333	3.77503	2.17951	5.5556	24.3110	12.25	19.25
50 ppm	3	15.9833	3.01759	1.74220	8.4872	23.4794	13.30	19.25
Total	12	14.3500	2.81586	.81287	12.5609	16.1391	10.15	19.25

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Between Groups	(Combined)	16.415	3	5.472	.618	.622
	Linear Contrast	14.406	1	14.406	1.628	.238
	Term Deviation	2.009	2	1.005	.113	.894
Within Groups		70.805	8	8.851		
Total		87.220	11			

PERLAKUAN	SR (%) (Rata-Rata ± SD)
0 ppm	13,30 ± 3,15 ^a
30 ppm	13,18 ± 1,46 ^a
40 ppm	14,93 ± 3,78 ^a
50 ppm	15,98 ± 3,02 ^a

GROWTH

Descriptives

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
0 ppm	3	.5267	.22279	.12863	-.0268	1.0801	.27	.67
30 ppm	3	.5300	.08660	.05000	.3149	.7451	.43	.58
40 ppm	3	.6200	.21378	.12342	.0890	1.1510	.38	.79
50 ppm	3	.7500	.18193	.10504	.2981	1.2019	.54	.86
Total	12	.6067	.18362	.05301	.4900	.7233	.27	.86

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Between Groups	(Combined)	.099	3	.033	.971	.453
	Linear Contrast	.087	1	.087	2.549	.149
	Term Deviation	.012	2	.006	.182	.837
Within Groups		.272	8	.034		
Total		.371	11			

PERLAKUAN	Growth (Rata-Rata ± SD)
0 ppm	0,53 ± 0,22 ^a
30 ppm	0,53 ± 0,09 ^a
40 ppm	0,62 ± 0,21 ^a
50 ppm	0,75 ± 0,18 ^a