Table of contents

Volume 236

2019

Previous issue Next issue

The 1st International Conference on Fisheries and Marine Science 6 October 2018, East Java, Indonesia

Accepted papers received: 16 January 2019
Published online: 01 March 2019

Open all abstracts

Preface

OPEN ACCESS 011001
The 1st International Conference on Fisheries and Marine Science
+ Open abstract View article PDF

OPEN ACCESS 011002
Organizing Committee
+ Open abstract View article PDF

OPEN ACCESS 011003
Conference Photos
+ Open abstract View article PDF

OPEN ACCESS 011004
Peer review statement
+ Open abstract View article PDF

Papers

OPEN ACCESS 012001
The Increase in β-carotene Content in *Dunaliella salina* from the Application of Different Light Intensities
N Sugiati, E D Masithah, W Tjahjaningsih and A A Abdillah
+ Open abstract View article PDF

OPEN ACCESS 012002

Ammonia-eliminating potential of *Gracilaria* sp. And zeolite: a preliminary study of the efficient ammonia eliminator in aquatic environment

M R Royan, M H Solim and M B Santanumurti

+ Open abstract View article PDF

OPEN ACCESS 012003

Identification of extracellular enzyme-producing bacteria (proteolytic, cellulolytic, and amylolytic) in the sediment of extensive ponds in Tanggulrejo, Gresik

OA Artha, Sudarno, H Pramono and LA Sari

+ Open abstract View article PDF

OPEN ACCESS 012004

Addition of water from the treatment pond of pangasius fillet waste (*Pangasius* sp.) with different concentrations in the cultivation medium due to the population growth of *Daphnia* sp.

H P Alvian, E D Masithah and M H Azhar

+ Open abstract View article PDF

OPEN ACCESS 012005

The growth and survival rate in lettuce aquaponic systems (*Latuca sativa*) of eels in various stocking densities of eel (*Monopterus albus*)

N K Portalia, L Sulmartiwi and B S Rahardja

+ Open abstract View article PDF

OPEN ACCESS 012006

The prevalence of benedeniasis in humpback grouper (*Cromileptes altivelis*) in floating net cages in Situbondo Regency, East Java, Indonesia

S O Wijaya, S Subekti and Kismiyati

+ Open abstract View article PDF

OPEN ACCESS 012007

The prevalence of fungi on groupers (*Epinephelus* sp.) in cage mariculture systems of the northern coast of Surabaya, East Java

E Yuliastuti, R Kusdawarti and Sudarno

+ Open abstract View article PDF

OPEN ACCESS 012008

The spectrum of light and nutrients required to increase the production of phycocyanin *Spirulina platensis*

H A Wicaksono, W H Satyantini and E D Masithah

+ Open abstract View article PDF

OPEN ACCESS 012009

The growth and survival rate of the larvae of the sunu grouper (*Plectropomus leopardus*) in different temperatures

L Lutfiyah, D S Budi and M F Ulkhaq

+ Open abstract View article PDF

OPEN ACCESS 012010

Preservation of common carp (*Cyprinus carpio*) sperm using 0.9% NaCl and ringer's lactate solution

D S Budi, L A Adawiyah and L Lutfiyah

+ Open abstract View article PDF

OPEN ACCESS 012011

Comparison of the efficiency (flash point, freezing point, and viscosity test) of biodiesels from *Sargassum* sp.

M B Santanumurti, M R Royan, S H Samara, S Sigit and M A Alamsjah

+ Open abstract View article PDF

OPEN ACCESS 012012

Study of patterns in the relationship of ecdysis with the age of freshwater crayfish *Cherax quadricarinatus* aged 76 Days

A H Fasya

+ Open abstract View article PDF

OPEN ACCESS 012013

Maximum density in the *Moina macrocopa* culture able to produce parthenogenesis in female offspring

A S Mubarak, D Jusadi, M Z Junior and M A Suprayudi

+ Open abstract View article PDF

OPEN ACCESS 012014

The oxygen content and dissolved oxygen consumption level of white shrimp *Litopenaeus vannamei* in the nanobubble cultivation system

D P Galang, A K Ashari, L Sulmatiwi, G Mahasri, Prayogo and LA Sari

+ Open abstract View article PDF

OPEN ACCESS 012015

The effect of the epiphytes of *Chaetomorpha crassa* on the total chlorophyll-a and growth of *Gracilaria verrucosa*

A L L Handayani, R J Triastuti and L Sulmartiwi

+ Open abstract View article PDF

OPEN ACCESS 012016

Growth monitoring of koi fish (*Cypri nus carpio*) in natural hatchery techniques in Umbulan, Pasuruan, East Java

F P Putri and N N Dewi

+ Open abstract View article PDF

OPEN ACCESS 012017

Dynamic Ratio Correlation of N:P in relation to the Diatom Abundance in the Intensive System of the Vannamei (*Litopenaeus vannamei*) Shrimp Pond

E D Masithah, D D Nindarwi, T Rahma and dan R R Satrya P I

+ Open abstract View article PDF

OPEN ACCESS 012018

Dynamic ratio correlation of N:P on the abundance of Bluegreen algae in an intensive system in a white shrimp (*Litopenaeous vannamei*) pond

E D Masithah, D D Nindarwi, A L A Suyoso and D Husin

+ Open abstract View article PDF

OPEN ACCESS 012019

Dynamic ratio correlation of N:P toward phytoplankton explosions in intensive systems of white shrimp pond

E D Masithah, D D Nindarwi, D Husin and T Rahma

+ Open abstract View article PDF

OPEN ACCESS 012020

Development of water and nutrient management models to improve multitrophic seafarming productivity

J A Surbakti, I A L Dewi, M A Alamsjah and M Lamid

+ Open abstract View article PDF

OPEN ACCESS 012021

Pond soil characteristic in reclaimed tidal lowlands and its correlation with the water quality for aquaculture

M Fitrani, I Wudtisin, M Kaewnern and R H Susanto

+ Open abstract View article PDF

OPEN ACCESS 012022

The dynamics of total organic matter (tom) on sangkuriang catfish (*clarias gariepinus*) farming at upt ptpbp2kp and the effectiveness of freshwater bivalve (*anodonta woodiana*) in reducing the total organic matter with varying density

D Arfiati, C D G Putra, A H Tullah, S W A Permanasari and A W Puspitasari

+ Open abstract View article PDF

OPEN ACCESS 012023

Growth and morphological changes in relation to the maturation of male Japanese eel, *Anguilla japonica* injected with human chorionic gonadotrophin (HCG) in the different interval in the tropical region

Y T Hee, F F Ching and S Senoo

+ Open abstract View article PDF

OPEN ACCESS 012024

Genetic diversity of the endangered species *Sphyrna lewini* (Griffith and Smith 1834) in Lombok based on mitochondrial DNA

S Hadi, N P Anggraini, E Muttaqin, B M Simeon, B Subhan and H Madduppa

+ Open abstract View article PDF

OPEN ACCESS 012025

Sex ratio and size at first maturity of razor clam *Solen* sp. in Pamekasan and Surabaya coastal area, East Java, Indonesia

N Trisyani, N I Wijaya and I Yuniar

+ Open abstract View article PDF

OPEN ACCESS 012026

Improving productivity and water quality of catfish, *Clarias* sp. cultured in an aquaponic ebb-tide system using different filtration

E Setiadi, I Taufik, Y R Widyastuti, I Ardi and D Puspaningsih

+ Open abstract View article PDF

OPEN ACCESS 012027

Different substrate of trickling filter on growth, survival rate, and water quality of common carp (*Cyprinus carpio*) cultivation by using an intensive recirculation system

E Setiadi, I Taufik, Y R Widyastuti, I Ardi and A Saputra

+ Open abstract View article PDF

OPEN ACCESS 012028

Water quality dynamic, production and profitability of catfish, *Clarias* sp. cultured at different design construction of aquaponic

Y R Widyastuti, E Setiadi, I Taufik and L Setijaningsih

+ Open abstract View article PDF

OPEN ACCESS 012029

Effect of C:N ratio on the spore production of *Bacillus* sp. indigenous shrimp pond

A Yuniarti, N B Arifin, M Fakhri and A M Hariati

+ Open abstract View article PDF

OPEN ACCESS 012030

Comparative Test on Bacteria in the Digestive Tract of Vannamei Shrimp (*Litopenaeus vannamei*) at Intensive and Extensive Ponds in Ujungpangkah, Gresik

D Ningrum, M Arief and dan K T Pursetyo

+ Open abstract View article PDF

OPEN ACCESS 012031

Growth Performance of Laboratory-Scale *Chaetoceros calcitrans* in Different Containers

M Jannah, M F Ulkhaq, M H Azhar, Suciyono and dan W Soemarjati

+ Open abstract View article PDF

OPEN ACCESS 012032

Study of the Dynamic Density and Diversity of Plankton at Different Brackishwater Pond Managements in Gresik, East Java

O Tilahwatih, E D Masithah and dan B S Rahardja

+ Open abstract View article PDF

OPEN ACCESS 012033

The Effect of Demineralization Stage of Agar's Solid Waste on the Characterization of Activated Carbon

R Febrianto, Sudarno and R Kusdarwati

+ Open abstract View article PDF

OPEN ACCESS 012034

The Dynamic of Density and Diversity of Cyanophyta in Different Pond Bases in Educational Pond of Faculty of Fisheries and Marine Universitas Airlangga

S Z Cahyani, E D Masithah and Prayogo

+ Open abstract View article PDF

OPEN ACCESS 012035

Effect of Different Salinity Level within Water Against Growth Rate, Survival Rate (FCR) of Catfish (*Clarias* sp.)

D Prananingtyas, Prayogo and S Rahardja

+ Open abstract View article PDF

OPEN ACCESS 012036

Molecular identification and phylogenetic reconstruction of two fiddler crabs (*Uca forcipata* and *Uca triangularis*)

S Andriyono, H Pramono and H W Kim

+ Open abstract View article PDF

OPEN ACCESS 012037

The molecular identification and phylogenetic reconstruction of Palaemonid and Penaeid shrimp from the southern part of Bangladesh

M J Alam, S Andriyono, A T M Eunus and H W Kim

+ Open abstract View article PDF

OPEN ACCESS 012038

Morphometric characteristics of Fur Cockles (*Anadara spp.*) in Wonokromo and Juanda Estuary, Surabaya

P B Pamungkas, K T Pursetyo, J Triastuti and N N Dewi

+ Open abstract View article PDF

OPEN ACCESS 012039

Stock status of ark clams (*Anadara spp.*) based on dredge fishing of the east coast of Surabaya, Indonesia

N N Dewi, K T Pursetyo, O P Darmono, F R Fachri, F S Puspitasari and A Damora

+ Open abstract View article PDF

OPEN ACCESS 012040

The distribution patterns and biomass of bivalves in Segoro Tambak estuary, Sedati, Sidoarjo, East Java

S H Liyana, L A Sari, N N Dewi, E D Masithah, A M Sahidu and K T Pursetyo

+ Open abstract View article PDF

OPEN ACCESS 012041

Inventorization of reef fish on Tabuhan Island, Banyuwangi, East Java, Indonesia

Suciyono, M A Azhar, M F Ulkhaq and H Kenconojati

+ Open abstract View article PDF

OPEN ACCESS 012042

Dynamic study on the effect of calcium hydroxide and sodium bicarbonate treatment on the N/P ratio and plankton abundance

M R N Tsany, E D Masithah, B S Rahardjo and D D Nindarwi

+ Open abstract View article PDF

OPEN ACCESS 012043

Distribution patterns and the biomass of bivalves at Segoro Tambak estuary, Sedati, Sidoarjo, East Java

S H Liyana, L A Sari, N N Dewi, E D Masithah, A M Sahidu and K T Pursetyo

+ Open abstract View article PDF

OPEN ACCESS 012044

Optimization of diatom *Haslea ostrearia* cultivation in different mediums and nutrients

S Arsad, C Stavrakakis, V Turpin, P Rossa, Y Risjani, L A Sari, F S Prasetiya and J-L Mouget

+ Open abstract View article PDF

OPEN ACCESS 012045

Coastal ecosystem model based on environmental suitability and carrying capacity of the fishpond in Banyuwangi Region, East Java, Indonesia

E W Setyaningrum, Maghdalena, A T K Dewi, M. Yuniartik and E D Masithah

+ Open abstract View article PDF

OPEN ACCESS 012046

Development and succession of sessile macrofouling organisms on the artificial structure in the Shallow Coastal Waters of Sabah, Malaysia

M A M Affandy, J Madin, K P Jakobsen and M Auluck

+ Open abstract View article PDF

OPEN ACCESS 012047

Fish species difference around the light of metal halide lamps and LED lamps with mini purse seine operation

M A Sofijanto, D Arfiati, T D Lelono and A Muntaha

+ Open abstract View article PDF

OPEN ACCESS 012048

Status of coral diseases and compromised health syndromes on Pemuteran shallow reefs, North Bali island

W Karim

+ Open abstract View article PDF

OPEN ACCESS 012049

Management options for restoring artificial coral reefs in Indonesia: strengthening in institutional approach

Rudianto and Ahmad Zainul

+ Open abstract View article PDF

OPEN ACCESS 012050

Growth of salt-secretor and non-salt secretor mangrove seedlings with varying salinity and their relations to habitat zonation

M Basyuni, Ramayani, A Hayullah, Prayunita, M Hamka, L A Putri and S Baba

+ Open abstract View article PDF

OPEN ACCESS 012051

Distribution of *Ctenactic Echinata* and *Fungia Consinna* coral on Mamburit island, Sumenep regency, East Java

Sawiya, D Arfiati, Guntur and U Zakiyah

+ Open abstract View article PDF

OPEN ACCESS 012052

Diversity species and condition of seagrass ecosystem in Teluk Awur and Prawean Jepara

I Riniatsih, A Ambariyanto, E Yudiati, R Hartati, W Widianingsih and R T Mahendrajaya

+ Open abstract View article PDF

OPEN ACCESS 012053

Copper (Cu) and Cadmium (Cd) toxicity on growth, chlorophyll-a and carotenoid content of phytoplankton *Nitzschia* sp

D Hindarti and A.W. Larasati

+ Open abstract View article PDF

OPEN ACCESS 012054

Vegetation Characteristic and Micro Environment of Mangrove Rehabilitation Forest at Coastal Areas of East Sinjai, South Sulawesi

H Setiawan

+ Open abstract View article PDF

OPEN ACCESS 012055

The Use of Water Lettuce (*Pistia stratiotesas*) as Phytoremediator for Concentration and Deposits of Heavy Metal Lead (Pb) Tilapia (*Oreochromis niloticus*) Gills

A A D Amalia, B S Rahardja and Rr J Triastuti

+ Open abstract View article PDF

OPEN ACCESS 012056

The Effectiveness of Heavy Metals Pb, Cd and Zn Reduction in NPK Fertilizer Waste Combined with Biofilters of Seaweed (*Gracillaria* sp.), Blood Clam (*Anadara* sp.), and Zeolite

A R K Sari, R K Harryes, F A Anggraini, M A Alamsyah and dan A Ahadi

+ Open abstract View article PDF

OPEN ACCESS 012057

The Effectiveness of Combining *Gracilaria* Sp. Seaweed Biofilter and *Anadara granosa* Shell with Zeolite in the Decrease in the Level of Mercury (Hg) Heavy Metal

J A Spespatri, B S Rahardja and A A Abdillah

+ Open abstract View article PDF

OPEN ACCESS 012058

The Effectiveness of Combination of Seaweed (*Gracillaria* sp.), Blood Clamp (*Anadara granosa*), and Zeolite as Biofilter in the Reduction of Heavy Metal Copper (Cu)

I A Lumbi, B S Rahardja and A A Abdillah

+ Open abstract View article PDF

OPEN ACCESS 012059

Bioaccumulation of Cadmium (Cd) Heavy Metal on Seaweed (*Gracilaria* sp.) in Traditional Fishpond of Jabon Subdistrict, Sidoarjo District

O Ardiyansyah, Sudarno and Rosmanida

+ Open abstract View article PDF

OPEN ACCESS 012060

Identification of Proteolytic Bacterial Isolates in Sediment Ecosystem of Gunung Anyar Mangrove Forest, Surabaya

P B Utomo, Sudarno and B S Rahardja

+ Open abstract View article PDF

OPEN ACCESS 012061

The Analysis of Cockle (Anadara inaequivalvis) Gonad Maturity Level in the Estuary of Banjar Kemuning River, Sedati, Sidoarjo

R F Saputra, E D Masithah and P D Wulansari

+ Open abstract View article PDF

OPEN ACCESS 012062

Spatial and Temporal Variation of Biomass Blood Cockle (*Anadara* sp.) in Estuaries Dadapan, Sedati Sub-District, Sidoarjo, East Java

M R Ramadhan, K T Pursetyo, Prayogo and N N Dewi

+ Open abstract View article PDF

OPEN ACCESS 012063

Distribution Patterns and Biomass of Bivalve in Juanda and Segoro Tambak Estuary in Sedati, Sidoarjo, East Java

S H Liyana, E D Masithah and A M Sahidu

+ Open abstract View article PDF

OPEN ACCESS 012064

Analysis of Cadmium (Cd) Heavy Metal on Sediment and Mangrove Leaves *Avicennia marina* at Mangrove Ecotourism Wonorejo, Surabaya

W C Dermawan, Prayogo and B S Rahardja

+ Open abstract View article PDF

OPEN ACCESS 012065

Analysis of Lead (Pb) Value Comparison on Seaweed (*Eucheuma cottonii*) in Bluto and Saronggi Sumenep Marine, Madura, East Java

N L Komariyah, K T Pursetyo and S A Sudjarwo

+ Open abstract View article PDF

OPEN ACCESS 012066

The potential addition of lemuru oil to commercial feed to increase the content of EPA and DHA in eels (*Monopterus albus*)

A Imanisa, M B Santanumurti, M Lamid and Agustono

+ Open abstract View article PDF

OPEN ACCESS 012067

Effect of lysine in addition to commercial feed on crude protein and the energy digestibility of gourami (*Osphronemus gouramy*)

D Setiyawan, S H Samara, Agustono and M A A Arif

+ Open abstract View article PDF

OPEN ACCESS 012068

Addition of the papain enzyme to commercial feed against protein retention and feed efficiency in eels (*Anguilla bicolor*)

DA Liono, M Arief, Prayogo and W Isroni

+ Open abstract View article PDF

OPEN ACCESS 012069

Combination of papain enzyme and phytase enzyme in commercial feed and the protein and energy retention of tilapia *Oreochromis niloticus*

A Saifulloh, M B Santanumurti, M Lamid and W P Lokapirnasari

+ Open abstract View article PDF

OPEN ACCESS 012070

The effect of giving cake artificial feed on the survival rate, and growth of Common carp (*Cyprinus carpio*) larva in an Installation of Freshwater Culture (IBAT) in Punten, Batu.

I P Zainiyah, Rozi, W H Satyantini and A M Sahidu

+ Open abstract View article PDF

OPEN ACCESS 012071

The Utilization of Phytase Enzymes and SEM Analysis in order to increase the Quality of Rice Bran as a Layer and Fish Feed

M Lamid, Anam Al-Arif and S H Warsito

+ Open abstract View article PDF

OPEN ACCESS 012072

The dynamic relationship of phytoplankton abundance and diversity in relation to white shrimp (*Litopenaeus vannamei*) feed consumption in intensive ponds

D D Nindarwi, E D Masithah, D Zulian and A LA Suyoso

+ Open abstract View article PDF

OPEN ACCESS 012073

Effect of partial replacement of fish meal with *Spirulina platensis* meal in practical diets and culture location on growth, survival, and color enhancement of percula clownfish *Amphiprion percula*

S Hudaidah, B Putri, S H Samara and Y T Adiputra

+ Open abstract View article PDF

OPEN ACCESS 012074

The Effect of Different level of Probiotic Addition on Commercial Feed against Digestibility and Efficiency of Nile Tilapia Feed (*Oreochromis Niloticus*)

D Taufik, M Arief and H Kenconojati

+ Open abstract View article PDF

OPEN ACCESS 012075

The Effect of Adding Synbiotics Into Commercial Feed Towards Protein Retention and Fat Retention of Dumbo Catfish (*Clarias* sp.)

H Syevidiana, M Arief and I S Hamid

+ Open abstract View article PDF

OPEN ACCESS 012076

The Effect of Adding Lysine in Commercial Feed on Growth Rate, Feed Efficiency, and Feed Convertion Ratio to Tambaqui (*Colossoma Macropomum*)

L V D Putra, U Agustono and S H Kenconojati

+ Open abstract View article PDF

OPEN ACCESS 012077

The Effect of Coconut Shell Liquid Smoke in Commercial Feed on Total Bacteria of *Pseudomonas Aeruginosa* in the Tilapia's Kidney (*Orechromis niloticus*)

M Rahmawati, Sudarno and S Subekti

+ Open abstract View article PDF

OPEN ACCESS 012078

The Effect of Coconut Shell Liquid Smoke in Commercial Feed Towards Total *Pseudomonasaeruginosa* Bacteria on Gastrointestinal Tract Tilapia (*Oreochromis Niloticus*)

S Rahmadini, Sudarno and S Subekti

+ Open abstract View article PDF

OPEN ACCESS 012079

Antibacterial activity of honey in preserving high-pressure cooked milkfish stored at room temperature

D A Hakim, W Tjahjaningsih and Sudarno

+ Open abstract View article PDF

OPEN ACCESS 012080

Bacterial composition in the gastrointestinal tract of *Uca* spp crabs fed on *Avicennia marina* leaf litter

M A B Kareho, E D Masithah and W Tjahjaningsih

+ Open abstract View article PDF

OPEN ACCESS 012081

The correlation between ectoparasite infestation and the total plate count of *Vibrio* sp. in pacific white shrimp (*Litopenaeus vannamei*) in ponds

G Mahasri, Rozi, A T Mukti, W H Satyantini and N M Usuman

+ Open abstract View article PDF

OPEN ACCESS 012082

In vitro study of an ethanolic extract of coffea leaves to inhibit freshwater pathogenic bacteria

H Kenconojati, MF Ulkhaq, DS Budi and MH Azhar

+ Open abstract View article PDF

OPEN ACCESS 012083

The effect of noni fruits (*Morinda citrifolia*) with different ripeness stages against the total erythrocytes and leukocytes of comet goldfish (*Carassius auratus*) infested by *Argulus*

E Setyaningsih, Kismiyati and S Subekti

+ Open abstract View article PDF

OPEN ACCESS 012084

The protection capacity of the crude and whole protein spores of *Myxobolus koi* as an immunostimulant material development in goldfish (*Cyprinus carpio*) for preventing Myxobolusis

G Mahasri, M Yusuf, R Woro and M B Santanumurti

+ Open abstract View article PDF

OPEN ACCESS 012085

Identification of white spot syndrome virus (WSSV) in pacific white shrimps (*Litopenaeus vannamei*) from ponds postexposure to immunogenic membrane proteins (*Zoothamnium penaei*)

P A Wiradana, G Mahasri, R E R Sari, U C Marwiyah and R Prihadhana

+ Open abstract View article PDF

OPEN ACCESS 012086

Gills and swimming leg histopathologies in pacific white shrimp (*Lithopenaeus vannamei*) from ponds exposed to the immunogenic membrane proteins of *Zoothamnium penaei*

R E R Sari, G Mahasri, P A Wiradana and U C Marwiyah

+ Open abstract View article PDF

OPEN ACCESS 012087

Total plate count and identification of vibrio in pacific white shrimp (*Litophenaeus vannamei*) from ponds and in those exposed to immunogenic protein membrane *Zoothamnium penaei*

U C Marwiyah, G Mahasri, R E Ratnasari and P A Wiradana

+ Open abstract View article PDF

OPEN ACCESS 012088

Effectiveness of *Nitrobacter* on the specific growth rate, survival rate and feed conversion ratio of dumbo catfish *Clarias* sp. with density differences in the aquaponic system

A S Taragusti, M B Santanumurti, B S Rahardja and Prayogo

+ Open abstract View article PDF

OPEN ACCESS 012089

The erythrocyte and leucocyte profile of saline tilapia (*Oreochromis Niloticus*) in a cultivation system with nanobubbles

M Gunanti, P D Wulansari and K Kinzella

+ Open abstract View article PDF

OPEN ACCESS 012090

The prevalence and intensity of ectoparasites infecting vanname shrimp (*Litopenaeus vannamei*) reared in different ponds

N Nurlatiffah, Kismiyati and MF Ulkhaq

+ Open abstract View article PDF

OPEN ACCESS 012091

Protozoan parasites of Vannamei Shrimp (*Litopenaeus vannamei*) in farmed fish from Pasuruan, Indonesia

U Hafidloh and P D W Sari

+ Open abstract View article PDF

OPEN ACCESS 012092

Growth of *Bacillus* sp. and *Flavobacterium* sp. in culture media with the addition of liquid whey tofu waste

W H Satyantini, R M Pratiwi, A M Sahidu and D D Nindarwi

+ Open abstract View article PDF

OPEN ACCESS 012093

The effect of noni *Morinda citrifolia* L. fruit extracts on the gill histopathological changes of Nile tilapia *Oreochromis niloticus*

A T Mukti, E Dewi, W H Satyantini, L Sulmartiwi, Sudarno and M Hassan

+ Open abstract View article PDF

OPEN ACCESS 012094

Prevalence and intensity of ectoparasites in Pacific white shrimp (*Litopenaeus vannamei*) seeds from a pond and hatchery

G Mahasri, T Hidayat and Sudarno

+ Open abstract View article PDF

OPEN ACCESS 012095

Prevalence and intensity of ectoparasites in gabus fish (*Channa striata*) at Cangkringan Fishery Cultivation Technology Development Center, Sleman, Yogyakarta

E N Fitriani, Rozi, M Arief and H Suprapto

+ Open abstract View article PDF

OPEN ACCESS 012096

Antibacterial activity of bitter gourd (*Momordica charantia l.*) leaf extract against *Aeromonas hydrophila*

D A Masithoh, R Kusdarwati and D Handijatno

+ Open abstract View article PDF

OPEN ACCESS 012097

Determination of the *aerolysin* gene in *Aeromonas hydrophila* using the polymerase chain reaction (pcr) technique

G Christy, R Kusdawarti and D Handijatno

+ Open abstract View article PDF

OPEN ACCESS 012098

Bioaccumulation and histopathological effect on the gills and liver of silver barb (*Barbonymus gonionotus*) exposed to the heavy metal nickel

I Purwanti, W Arroisi, B S Rahardja and L Sulmartiwi

+ Open abstract View article PDF

OPEN ACCESS 012099

Identification and prevalence of the ectoparasite *Octolasmis* in sand lobster (*Panulirus homarus*) and bamboo lobster (*Panulirus versicolor*) in Floating Net Cages in Sape, Bima Regency, West Nusa Tenggara Province, Indonesia

L. Yusgita, Kismiyati, S. Subekti, P D Wulansari and M K Amiin

+ Open abstract View article PDF

OPEN ACCESS 012100

Treatment of *Chlorella sp*. extract on heat shock cluster (HSC) response from the tissue and bloodcells proliferation of *Epinephelus fuscoguttatus-lanceolatus* infected by *Viral Nervous Necrosis*

U Yanuhar, I Al-Hamidy and N R Caesar

+ Open abstract View article PDF

OPEN ACCESS 012101

Superdioxide dismutase (SOD) and metallothionein (MT) *Tubifex tubifex* at the acute mercury exposure

I M Widiastuti, A M S Hertika, M Musa and D Arfiati

+ Open abstract View article PDF

OPEN ACCESS 012102

Antifungal activity of marine sponges (Class Demospongiae) collected from Biak, Indonesia

R D Kasitowati, K Wittriansyah, A Trianto, D C Pratiwi and M A P Panjaitan

+ Open abstract View article PDF

OPEN ACCESS 012103

Antibacterial activities of *Physalis angulata* herb extract on white feces diseases (WFD) in *Litopenaeus* shrimp *vannamei*

E Saraswati and AS Wijaya

+ Open abstract View article PDF

OPEN ACCESS 012104

The Effects of Mercury Chloride (Hgcl2) on the Changes in Hematology and Blood Sugar Level in Carps (*Cyprinus carpio*)

I Setiyowati, H Suprapto and G Mahasri

+ Open abstract View article PDF

OPEN ACCESS 012105

Change in Two-Spot Catfish Histopathological Liver (Mystus nigriceps) Accumulated with Heavy Metal Cadmium (Cd) in Ketingan Estuary, Sidoarjo - East Java, Indonesia

L Anggitasari, H Suprapto and dan D D Nindarwi

+ Open abstract View article PDF

OPEN ACCESS 012106

Effectiveness of Pepaya Leaf Extract (*Carica Papaya* L.) to Control Ectoparasite *Argulus* on Common Carp (*Cyprinus Carpio*)

L S Azizah, Kismiyati and A H Fasya

+ Open abstract View article PDF

OPEN ACCESS 012107

Bacterial Identification from Marine Ornamental Fish in Fish Quarantine, Quality Control and Fishery Products Safety Class I Denpasar, Bali

N R Rukmana, G Mahasri, S N Hidayah, M F Ulkhaq and H Kenconojati

+ Open abstract View article PDF

OPEN ACCESS 012108

Prevalence and Intensity of Ectoparasites of Tilapia (*Oreochromis niloticus*) in Ponds with Low, Medium and High Stocking Density

M Indahsari, Kismiyati and M F Ulkhaq

+ Open abstract View article PDF

OPEN ACCESS 012109

Texture profile of the bread produced from composite flour *Bruguiera gymnorrhiza* flour (BGF) and wheat flour

M N G Amin, M N Hasan, Zakariya, S A Pralebda, H Pramono, E Saputra, S Subekti and M A Alamsjah

+ Open abstract View article PDF

OPEN ACCESS 012110

The potential of seaweed waste (*gracilaria* sp. and *eucheuma cottonii*) as a medium density fiberboard (mdf)-based pot material for better water use efficiency in tomato plants

H Kurnia, R R Rifadi, Agustono, M N G Amin, S A Sudjarwo and M A Alamsjah

+ Open abstract View article PDF

OPEN ACCESS 012111

Characterization of edible coating based on surimi fillet catfish as biodegradable packaging

E Saputra

+ Open abstract View article PDF

OPEN ACCESS 012112

Characteristics of the fish protein isolate recovered from Sardine by-products using the Isoelectric Solubilization- Precipitation method

H. Pramono, N T Irawan and M R A Firdaus

+ Open abstract View article PDF

OPEN ACCESS 012113

The potential of peptides derived from the chymotrypsin hydrolysate of soft shelled turtle yolk against the Angiotensin I Converting Enzyme

D Y Pujiastuti and J L Hsu

+ Open abstract View article PDF

OPEN ACCESS 012114

Kappa and iota carrageenan combination of *Kappaphycus alvarezii* and *Eucheuma spinosum* as a gelatin substitute in ice cream raw material product

I Suryani, D I Permata Sari, D M Astutik and A Abdillah

+ Open abstract View article PDF

OPEN ACCESS 012115

Detection of antibiotic-resistant *Salmonella* sp. in the seafood products of Surabaya local market

H Pramono, A Kurniawan, N Andika, T F Putra, M A R Hazwin, S Utari, A P Kurniawan, E D Masithah and A M Sahidu

+ Open abstract View article PDF

OPEN ACCESS 012116

The effect of kappa-carrageenan fortification on the physicochemical and organoleptic properties of milkfish galantin

D Darmawan, L Sulmartiwi and A A Abdillah

+ Open abstract View article PDF

OPEN ACCESS 012117

The application of a high voltage electric field (HVEF) to reduce *Escherichia coli* and *Salmonella thyphimurium* bacteria in red snapper (*Lutjanus* sp.) fillets

D J Subakti, H Pramono and J Triastuti

+ Open abstract View article PDF

OPEN ACCESS 012118

Isolation and identification of fish import consumption bacteria in a fish quarantine center, focusing on the quality control and safety of fishery products at Tanjung Priok, Jakarta

H S Farizky and W H Satyantini

+ Open abstract View article PDF

OPEN ACCESS 012119

Replacement of gum arabic by dry *Spirullina* sp. biomass as a food emulsifier in bread making

D Wulandari, M N G Amin, E D Masithah, M Lamid and M A Alamsjah

+ Open abstract View article PDF

OPEN ACCESS 012120

Nutrient improvement of *Bruguiera gymnorrhiza* peel fruit through fermentation using commercial tempeh (Indonesian fermented soybean) mold

M N G Amin, R A Prastiya, M N Hasan, Zakariya and M A Alamsjah

+ Open abstract View article PDF

OPEN ACCESS 012121

DPPH scavenging property of bioactives from soft corals origin palu bay, Central Sulawesi, Indonesia

W A Tanod, U Yanuhar, Maftuch, D Wahyudi and Y Risjani

+ Open abstract View article PDF

OPEN ACCESS 012122

Extraction of bioactive compounds fruit from *Rhizophora mucronata* using sonication method

Ernawati, E Suprayitno, Hardoko and U Yanuhar

+ Open abstract View article PDF

OPEN ACCESS 012123

Harvesting *Chaetoceros gracilis* by flocculation using Chitosan

W AA Yamin, S R M Shaleh, F F Ching, R Othman, M Manjaji-Matsumoto, S Mustafa, S Shigeharu and G Kandasamy

+ Open abstract View article PDF

OPEN ACCESS 012124

The Use of Rajungan (*Portunus Pelagicus*) Shells as Flour in Wet Noodles Ingredient

A Rahma, A A Abdillah and E Saputra

+ Open abstract View article PDF

OPEN ACCESS 012125

The Potential of Lindur Fruit Flour (*Bruguiera Gymnorrhiza*) in Reducing Oil Absorption of Milkfish Nugget during the Deep Frying Process

A Widyastuti, AA Abdillah and Laksmi Sulmartiwi

+ Open abstract View article PDF

OPEN ACCESS 012126

Chemical and Sensory Characteristics of Flakes Made from Seaweed (*Eucheuma cottonii*) and Soybean (*Glycine max* (L.) Merill)

I R Firdarini, Kismiyati and A Manan

+ Open abstract View article PDF

OPEN ACCESS 012127

The Effect of Maltodextrin Concentration on the Characteristics of Snappers' (*Lutjanus* sp.) Peptone

R Ningsih, Sudarno and Agustono

+ Open abstract View article PDF

OPEN ACCESS 012128

Physics and Chemical Characteristics of Sargassum Sp. Seaweed with Addition of Sodium Alginate Stabilizer to Different Concentrations

M Via, A A Abdillah and M A Alamsjah

+ Open abstract View article PDF

OPEN ACCESS 012129

The Effect of Sorbitol Addition on the Characteristic of Carrageenan Edible Film

M Rahmawati, M Arief and W H Satyantini

+ Open abstract View article PDF

OPEN ACCESS 012130

The Utilization of Flower Crab (*Portunus Pelagicus*) Shell as Pasta Flavor

R Rahmawati, E Saputra and A A Abdillah

+ Open abstract View article PDF

OPEN ACCESS 012131

Income analysis of catching fish using dogol (demersal danish seine) in the sub-district of Brondong, Lamongan

A Aulia, A M Sahidu and Agustono

+ Open abstract View article PDF

OPEN ACCESS 012132

Area development based on conservation and ecotourism on the Cemara Beach (Pine Trees Beach), Pakis, Banyuwangi, East Java Province, Indonesia

E W Setyaningrum, A T K Dewi, K P Prapti, Z Erwanto and H D Susanti

+ Open abstract View article PDF

OPEN ACCESS 012133

Socioeconomic and institutional factors affecting the sustainable development for fisheries in Bontang City, Indonesia

B I Gunawan

+ Open abstract View article PDF

OPEN ACCESS 012134

Factors influencing the market requirements fulfillment in small medium enterprise fish processors in East Java

W Sulistyowati, Soemarno, A Efani and M Primyastanto

+ Open abstract View article PDF

JOURNAL LINKS

Journal home

Journal scope

Information for organizers

Information for authors

Contact us

Reprint services from Curran Associates

The Analysis of Cockle (Anadara inaequivalvis) Gonad Maturity Level in the Estuary of Banjar Kemuning River, Sedati, Sidoarjo

To cite this article: R F Saputra *et al* 2019 *IOP Conf. Ser.: Earth Environ. Sci.* **236** 012061

The Analysis of Cockle (Anadara inaequivalvis) Gonad Maturity Level in the Estuary of Banjar Kemuning River, Sedati, Sidoarjo

R F Saputra, E D Masithah, and P D Wulansari
Fisheries and Marine Faculty, Universitas Airlangga, Surabaya, Indonesia

Abstract.Cockle (Anadara inaequivalvis) is aquatic biota belonging to the mollusk group. Cockle has a high potential because all parts of its body can be processed and economic value. Cockle can be used for consumption and the shells can be used as jewelry. According to the data from WWF Indonesia (2017), the production of cockle in the estuary of Banjar Kemuning River from 2006-2016 decreased in average by 0.84% every year. One of the efforts in maintaining the availability of cockle in the waters is conducting research on the analysis of gonad maturity level on cockle. The purpose of this research is to learn the morphological structure and histological structure of cockle gonad (Anadara inaequivalvis) in the estuary of Banjar Kemuning River at different levels of gonad maturity and to learn the maturity level of cockle gonad (Anadara inaequivalvis) in the estuary of Banjar River Kemuning through morphological and histological observation. This research used descriptive method with data collection by field observation. The sampling technique used the method of quota sampling. The analysis result shows that gonad maturity level of cockle in the estuary of Banjar Kemuning River in December is dominated by TKG IV, in January is dominated by TKG I, and in February is dominated by TKG II. The male cockle's first mature gonads are at the shell length of 35.73 mm (34.55-36.91 mm) and female cockle's first mature gonad are at the shell length of 37.21 mm (36.06-38.37 mm).
Keywords. cockle, gonad maturity levels, index maturity levels, the estuary of banjar kemuning river.

1. Introduction

Cockles are aquatic biota that belong to the mollusk group. Cockle live in tidal areas or in estuarine regions with mud substrates to areas bordering with mangrove forests (Pattikawa, 2007). Cockles are used in some food preparations and are special attraction for the community. Cockle taste good and contain high nutrition. The production of cockles at the Banjar Kemuning River estuary from 2006-2016 has decreased by an average of 0.84% per year (WWF Indonesia, 2017). One of the efforts in maintaining the availability of cockle in the waters is conducting research on the analysis of the level of gonad maturity in cockle.

The level of gonad maturity is a certain stage of gonad development before and after organisms spawn (Effendie 2002). According to Jayadi (2011), the level of gonad maturity is needed to determine the comparison between organisms that have matured gonads and those that are immature, size or age of the organism when first gonads mature to determine whether the organism has spawned or not, the spawning period, and the frequency of spawning. The level of gonad maturity is needed to determine the size of the first mature gonad in the cockle. The determination of the first size of the gonad maturity

is used as a reasonable measure of capture on cockle, so that the size of the cockle with immature gonad is not caught and availability of cockle in the waters will be more preserved.

2. Method of implementation

2.1. Research place and time

This research was carried out at the estuary of the Banjar Kemuning River, Sedati, Sidoarjo from December 2017 to February 2018. Morphometric measurements, histological making and analysis of gonad cockle were carried out at the Microbiology Laboratory, Faculty of Fisheries and Marine, Universitas Airlangga, Surabaya. Substrate type analysis was carried out at the Soil and Stone Mechanics Laboratory, Faculty of Civil Engineering, Sepuluh November Institute of Technology, Surabaya.

2.2. Research tools and materials

The materials used in this study were cockle (Anadara inaequivalvis), water samples, and substrate. The ingredients for making gonad histology preparations are Davidson solution, multilevel alcohol (60%, 70%, 80% and 96%), xylol, paraffin, entellan neu, haematoxilin and eosin (HE) solutions. The equipment used in this study were motorboats, scallop fishing gear (garit), cool-box, Eikman grabs, label paper, baskets, plastic clips, permanent markers, and GPS. Water quality measurement equipment include thermometer, refractometer, DO meter, and pH meter. The morphometric measurement equipment include a shear period with an accuracy of 0.05 mm and an O-Haus scale with an accuracy of 0.0001 grams. The gonad histology manufacturing and analysis equipment include a set of sectio, cassette, hotplate, microtome, tissue processing, object glass, cover glass, and light microscope tools.

2.3. Work procedure

2.3.1. Determination of sampling points

Determination of sampling points for shells, water, and substrate was carried out by a preliminary survey in advance to determine the geography and activities around the research environment (Hadi, 2007). Based on the results of the preliminary survey, the research location is the fishermen's daily catchment area. The location point for cockle, water and substrate sampling was divided into five points which were considered to represent the research area, namely the estuary of the Banjar Kemuning River, Sedati, Sidoarjo.

2.3.2. Sampling of cockle, water, and substrate

The number of samples of cockle (Anadara inaequivalvis) needed in this study was 100 cockles. The cockle samples were collected by using garit fishing gear. There were 20 cockles taken at each point, and with all five points, the total samples were 100 samples. The collected cockles were put into a plastic bag, then stored in the cool box and analyzed in the laboratory. Water sampling was done using a water sampler. The measured water quality parameters consisted of temperature, salinity, DO, and pH. Substrate retrieval was conducted by using Eikman grab. The collected substrate was put into a plastic bag, then stored in the cool box and taken to the laboratory for analysis.

2.3.3. Morphometric measurements

The shell of cockle sample was measured by morphometric measurements, including shell length (mm) and shell width (mm), using calipers with a precision of 0.05 mm. Cockles that have been measured in length were grouped in 3 class range of shell length that were previously determined by the researcher, namely 27.1-33.0 mm (small); 33.1-3.0 mm (medium); and 39.1-45.0 mm (large). Fur scallop samples were then measured for total weight (g), weight of meat (g), and weight of gonads (g) using O-Haus scales with 0.0001 gram accuracy.

2.3.4. Observation of gonad maturity levels of cockle

Gonad observation began with sex determination. Female cockle are characterized by the color of the reddish orange gonad and egg grains, while the male cockles have a milky white gonad color (Widyastuti, 2011). Morphological observations on the level of cockle's gonad maturity is done by using visual observations based on the extent of gonad closure on visceral mass (Hartati et al., 2005). Observation of gonad maturity level was carried out histologically by preparing gonad tissue and observing the tissue structure.

2.4. Data Analysis

The data collected in this study were qualitative and quantitative data. Data analysis was carried out descriptively. Data analysis can also be used to draw a conclusion in the study.

3. Result and discussion

The following are the results and discussion of research on the maturity level of the cockle (Anadara inaequivalvis) gonad at the estuary of the Banjar Kemuning River.

3.1.Gonad maturity level of cockle, morphologically.

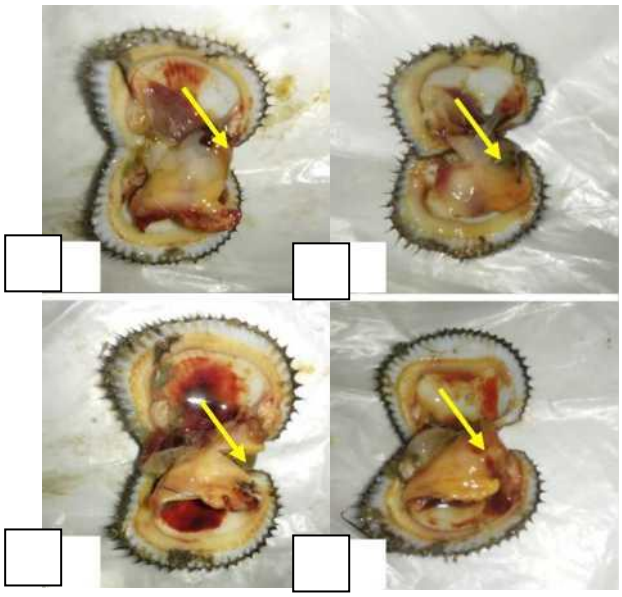

Figure 1. Gonad maturity level of male cockle, morphologically.
(a = TKG I, b = TKG II, c = TKG III, d = TKG IV).

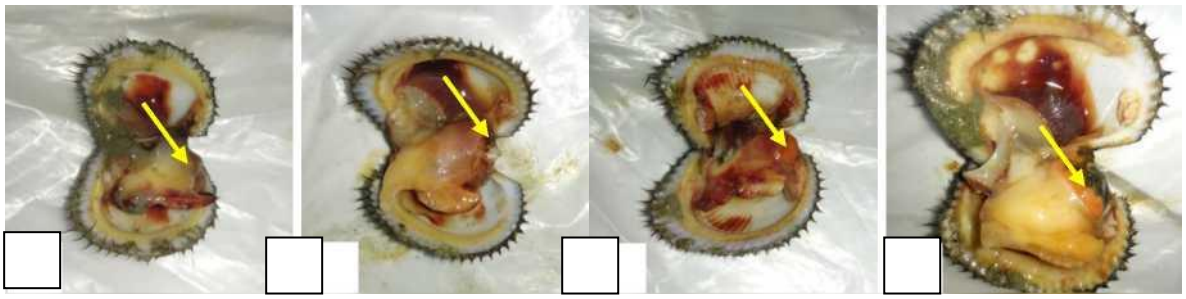

Figure 2. Gonad maturity level of female cockle, morphologically.
(a = TKG I, b = TKG II, c = TKG III, d = TKG IV).

Figure 1 and Figure 2 show that at TKG I (resting), gonads of male and female cockle appear very small and have not covered the visceral mass area. Gonads begin to develop in TKG II (developing). Male cockle's gonads are white and females' are light orange. The area of gonads in the visceral mass area is around <60%. TKG III (mature) shows that the gonad is growing. The male cockle's gonads are white and the females' are slightly brownish orange. The area of the gonads in the visceral mass area is around 60-90%. TKG IV (spawning) shows a mature gonad. Male cockle's gonads are white and females' are brownish orange. The area of gonads in the visceral mass area is around 90%.

3.2. Gonad maturity level of cockle, histologically

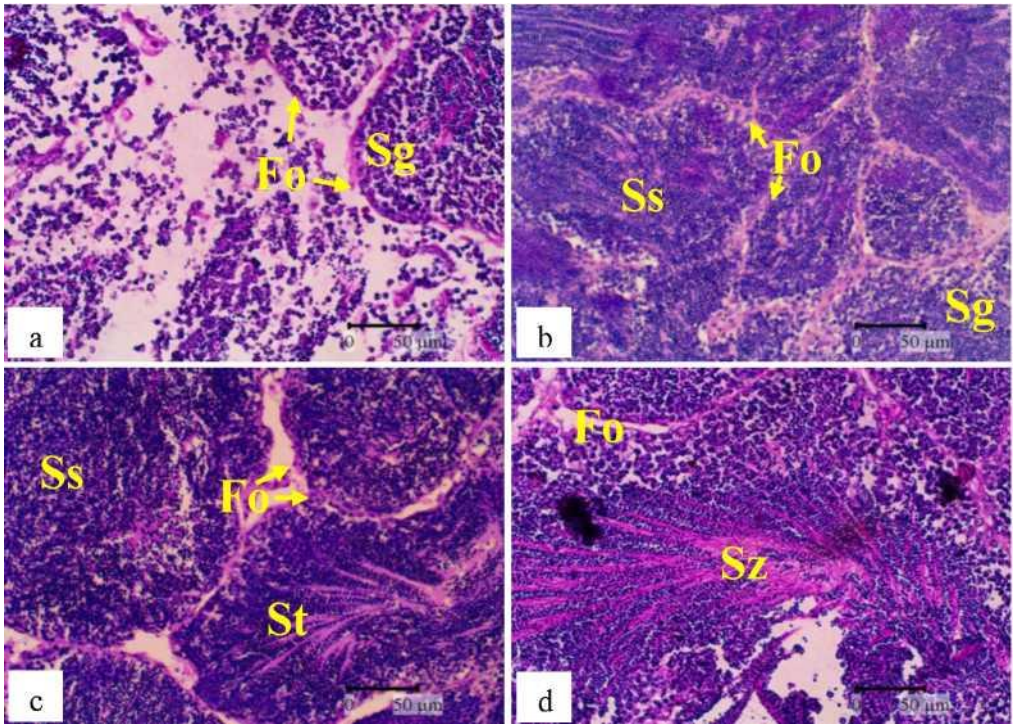

Figure 3. Gonad maturity level of male cockle, histologically, with 400x magnification
Description: a = TKG I, b = TKG II, c = TKG III, d = TKG IV
Fo = Follicle, Sg = Spermatogonia, Ss = Spermatocyte,
St = Spermatids, Sz = Spermatozoa

Figure 3a shows that at TKG I (resting), the follicular cavity contains spermatogonia but not too many. Figure 3b shows that in TKG II (developing), the spermatogonia then begin to develop into spermatocytes. Spermatocytes then develop into spermatids in TKG III (mature) (Figure 3c), which then develops into spermatozoa. This is indicated by the presence of grooves in the follicle. Figure 3d shows that in TKG IV (spawning), there are many spermatozoa that come out of the follicle. The follicular cavity appears to be empty, marked by the number of grooves in the follicle

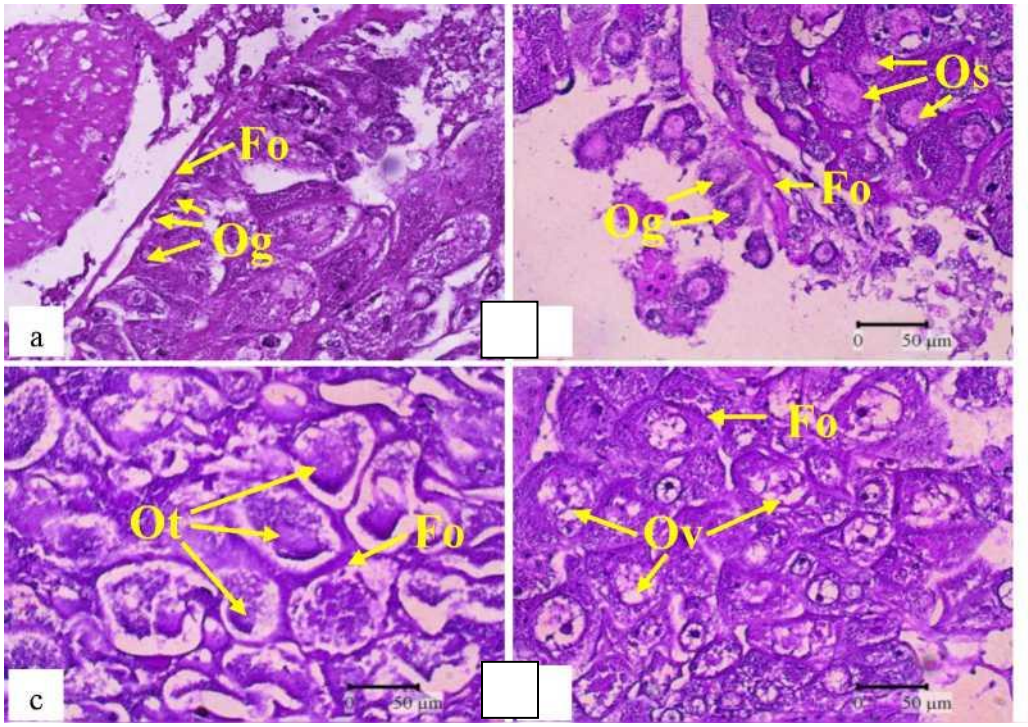

Figure 4. Gonad maturity level of male cockle, histologically, with 400x magnification
Description: a = TKG I, b = TKG II, c = TKG III, d = TKG IV
Fo = Follicle, Og = Oogonia, Os = Oocyte,
Ot = Ootids, Ov = Ovum

Figure 4a shows that at TKG I (resting), the follicle wall contains a lot of oogonia. Oogonia then develops into Oocytes in TKG II (developing) (Figure 4b), which then develop into ootids in TKG III (mature) (Figure 4c). Ootid then develops into an ovum and is ready to be released and then fertilized by spermatozoa. Figure 4d shows that in IV TKG (spawning), a lot of the ovum has been removed. It is indicated from the follicular cavity that starts to be empty.

3.3. Gonad maturity level of male cockle in the Banjar Kemuning River Estuary

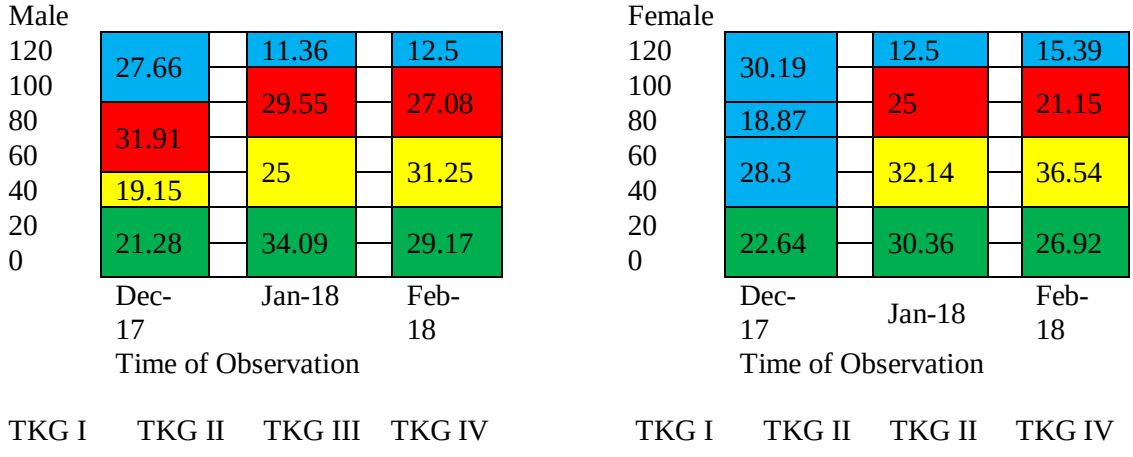

Figure 5. Percentage of gonads maturity based on time of observation.

The observation of gonad maturity level of male cockle and female cockle in the estuary of the Banjar Kemuning River in December was dominated by TKG IV which was equal to 57.85%; in January, TKG

I was dominated at 64.45%; and in February TKG II was dominated at 67.79%. Mackie (1984) claimed that gonad shellfish maturity was influenced by several factors, namely exogenous and endogenous factors. Exogenous factors include: temperature, month period, depth, mechanical factors, abundance and availability of feed, and light intensity, while endogenous factors, including genetics and hormones.

3.4. First Measurement of Cockle's Gonad Maturity in Banjar Kemuning River Estuary

The first measurement of mature gonads was determined based on the maturity level of the cockle's gonad at each shell length interval using the Spearman-Karber method (Udupa, 1986).

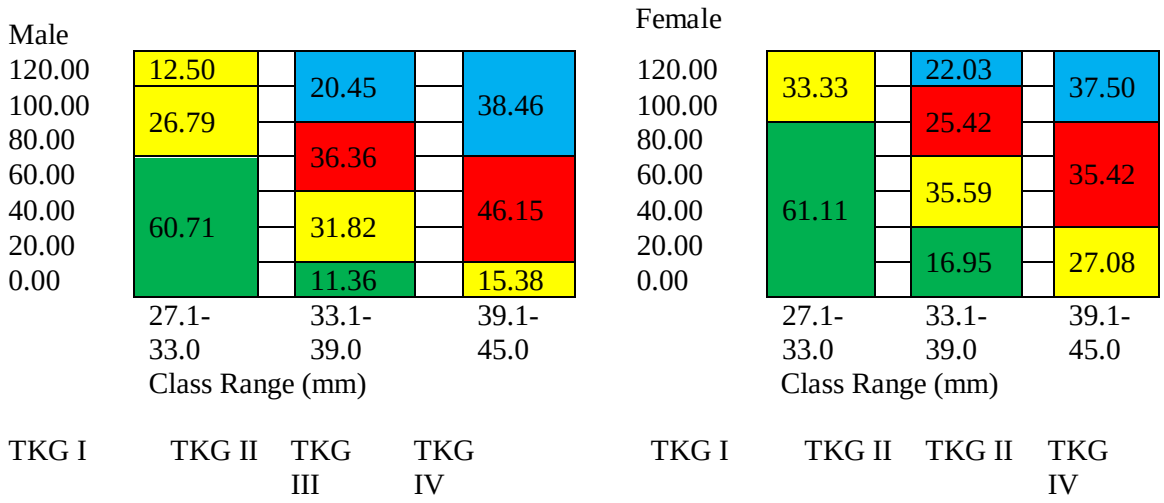

Figure 6. Percentage of gonad maturity based on the range of length class.

The results of the determination of the first size of mature gonad in male cockle and female cockle were determined by using the Spearman-Karber method. The male cockle's first gonads matured at a shell length of 35.73 mm (range 34.55-36.91 mm) and female cockle gonad matured at 37.21 mm in length (range 36.06-38, 37 mm). The first size of ripe gonad shells is male fur and female cockle are in the class range the size of the shell length 33.1-39.0 mm. Moresco and Bemvenuti (2006) state that the size of the first gonads mature differently; it is a reproductive strategy to restore the balance of the population caused by changes in conditions, abiotic factors and over-catch.

3.5. Index of cockles' gonad maturity in Banjar Kemuning River Estuary

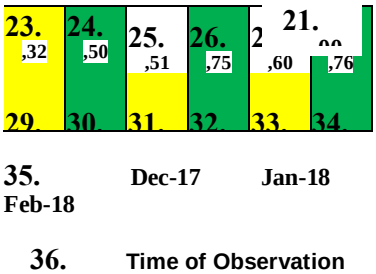

Figure 7. Index of cockles' gonad maturity based on time of observation

The IKG value in December has the highest IKG average value compared to January and February since in December, cockles were dominated by TKG IV. The average IKG score decreased in January because cockle were dominated by TKG I. The average IKG score rose again but was not significant in February because cockles were dominated by TKG II. According to Nurohman (2012), the higher the

level of gonad maturity, the greater the IKG value, which is related to the size of the gonad that increases along with the development of the gonad. As the gonad develops, the gonad will get bigger and heavier, then when it reaches gonad maturity, the value of IKG will be even greater.

3.6. Sex ratio of cockles in Banjar Kemuning River Estuary

Table 1. Sex ratio of cockles based on the time of observation.

Time of Observation	Frequency		Ratio	chi square		Remark
	Male	Female		x2 calculated	x2 table	
December 2017	47	53	1:1.11	0.36	3.841	balance
January 2018	44	56	1:1.21	1.44		balance
February 2018	48	52	1:1.08	0.16		balance
Total	139	161	1:1.14	1.613		balance

The sex ratio of cockle based on observation time (Table 1) shows the results of the x-test (Chi-square) with a confidence level of 95% in December to January having a calculated x value lower than the x table value. It can be said that the sex ratio of male cockle and female cockle based on the observation time is in a balanced condition. This condition means that each mother shell has its own pair and is predicted to guarantee the success of fertilization during spawning provided that food and environmental conditions support this process (Natan, 2008).

3.7. Aquatic conditions of the Banjar Kemuning River Estuary

Table 2. Conditions for the estuary of the Banjar Kemuning River.

Parameter		Time of Observation		
		Dec 17	Jan 18	Feb 18
Water Quality	Temperature (oC)	28.6	28.4	29.6
	pH	8.0	8.2	7.7
	Salinity (ppt)	35	35	26
	DO (ppm)	4.33	6.82	2.34
Substrate	Gravel (%)	0.14		
	Sand (%)	2.80		
	Mud (%)	97.06		
	Particle Size (mm)	<0.075		

The water parameters measured in the Banjar Kemuning River Estuary include water quality and substrate type. Water quality parameters measured include temperature, pH, salinity and dissolved oxygen (DO). Overall, the environmental conditions at the Banjar Kemuning river mouth can support the development of the cockle gonad.

4. Conclusion and Suggestion

The morphology of cockle gonad shows that the area of the gonad will increase along with the increased levels of gonad maturity. Histology of male cockle gonad in TKG I is dominated by spermatogonia, TKG II is dominated by spermatocytes, TKG III is dominated by spermatids, and TKG IV is dominated by spermatozoa. Histology of female cockle gonad in TKG I is dominated by oogonia, TKG II is dominated by oocytes, TKG III is dominated by ootid, and TKG IV was dominated by ovum. The maturity level of the gonad of cockle in the estuary of the Banjar Kemuning River in December 2017 was dominated by TKG IV, in January 2018 it was dominated by TKG I, and in February 2018 it was dominated by TKG II.

5. References

[1] Effendie, M. I. 2002. Biologi Perikanan. Yayasan Pustaka Nusatama. Yogyakarta.
[2] Hadi, A. 2007. Prinsip Pengelolaan Pengambilan Sampel Lingkungan. Gramedia Pustaka Utama. Jakarta. hal 134.
[3] Hartati, R., W. Ita dan R. Yoki. 2005. Histologi Gonad Kerang Totok Polymesoda erosan (Bivalvia : Corbiculidae) dari Laguna Segara Anakan, Cilacap. Jurnal Ilmu Kelautan 10(3) : 119-125.
[4] Jayadi, M. I. 2011. Aspek Biologi Reproduksi Ikan Pari (Dasyatis kuhlii Muller & Henle, 1841) yang Didaratkan di Tempat Pelelangan Ikan Paotere Makassar. Skripsi. Fakultas Ilmu Kelautan dan Perikanan. Universitas Hasanuddin. Makassar.
[5] Mackie, G. L. 1984. Bivalve in Wilbur, K. (ed). The Mollusc. Academy Press. Orlando. San Diego. San Fransisco. New York. 351-418 pp.
[6] Natan, Y. 2008. Studi Ekologi dan Reproduksi Populasi Kerang Lumpur (Anodontia edentula) pada Ekosistem Mangrove Teluk Ambon Bagian Dalam. Disertasi. Sekolah Pascasarjana. Institut Pertanian Bogor. Bogor.
[7] Nurohman. 2012. Laju Eksploitasi dan Keragaan Reproduksi Kerang Darah (Anadara Granosa) di Perairan Bondet dan Mundu, Cirebon, Jawa Barat. Skripsi. Fakultas Perikanan dan Ilmu Kelautan. Institut Pertanian Bogor. Bogor.
[8] Pattikawa, J. A. 2007. Pertumbuhan Kerang Bulu (Anadara antiquata) di Perairan Pantai Passo, Teluk Ambon, Maluku. Jurnal Ilmu Kelautan 12 : 181-186.
[9] Udupa, K. S. 1986. Statistical Method of Estimating The Size at First Maturity in Fishes. Fishbyte 4(2): 8-10.
[10]Widyastuti, A. 2011. Perkembangan Gonad Kerang Darah (Anadara antiquata) di Perairan Pulau Auki, Kepulauan Padadido, Biak, Papua. Jurnal Oseanologi dan Limnologi di Indonesia 37(1) : 1-17.