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UDC 639.31

Imron, Bambang Iswanto, Narita Syawalia Ridzwan, Rommy Suprpto, and Huria Marnis (*Research Institute for Fish Breeding, Sukamandi, West Java*)

Association of microsatellite genetic diversity with growth related traits in the base population of African catfish, *Clarias gariepinus*, breeding program

Ind. Aqua. Journal Vol. 10 No.1, 2015 p: 1-11

Genetic diversity at molecular level has been assumed to correlate with fitness related traits. However, accumulating evidences showed that the nature of that correlation has been variable. This study was aimed to explore the nature and possible mechanisms underlying that correlation by focusing on growth related traits in African catfish, *Clarias gariepinus* using microsatellite molecular markers. Fifty individual African catfish of 110 days-old were sampled and subjected to both morphological and molecular analyses. The standard length, total length and body weight as well as allelic scores of six microsatellite loci were measured on each individual. Indices of microsatellite diversity, namely individual multilocus heterozygosity (MLH) and mean microsatellite allelic distance (mean d2) for individual level, and mean observed heterozygosity (H_o) and single-locus heterozygosity (h_o) for group level, were correlated to those traits using Pearson correlation coefficient (r). The Hardy-Weinberg and linkage disequilibrium were carried out to explore the possible mechanisms underlying correlation. The results showed that at individual level the MLH and mean d2 were weakly correlated with standard length, ($r=0.25$, $p<0.05$) and ($r=0.24$, $p<0.05$), respectively. At group level, H_o was correlated with both standard and total length ($r=0.99$, $p<0.05$) while h_o identified two loci, Cga03 and Cga06 significantly contributed to the correlation. Combining all relevant information, present study identified associative overdominance, both local effect and general effect hypotheses might responsible for the observed correlations.

Keywords: microsatellite genetic diversity, multilocus heterozygosity, microsatellite allelic distance, observed heterozygosity, African catfish, *Clarias gariepinus*

UDC 639.64

Emma Suryati, Rosmiati, Andi Parenrengi, and Andi Tenriulo (*Research and Development Institute for Coastal Aquaculture, Maros*)

In vitro growth rate of *Kappaphycus alvarezii* micropropagule and embryo by enrichment medium with seaweed extract

Ind. Aqua. Journal Vol. 10 No.1, 2015 p: 13-17

The development of micropropagule and embryo of seaweed depend on nutrient and fertilizer used. Seaweed has been reported contain hormone regulators such as auxine, cytokinine, gibbereline, and various minerals applied in stimulating the growth ocra plant and wheat culture. The objectives of this study were to determine the potential of *Kappaphycus alvarezii* extract and its optimal concentration in accelerating of *Kappaphycus alvarezii* micropropagule and embryo growth. Micropropagule and embryo produced through callus induction were planted into PES 1/20 liquid medium supplemented with seaweed extract at the concentrations of 0 (control), 25, 50, 75, and 100 μ L in 10 mL of medium. The results showed that medium enrichment with 50 μ L of seaweed extract had the highest survival rate and growth of thallus. In addition, this concentration was also resulted in a good performance of *K. alvarezii* thallus with the lighter color. The advantage of this study for seaweed cultivation in Indonesia, among others, seaweed can be used as fertilizer, especially in the maintenance of seaweed seed, so that cultivation can be better develop.

Keywords: callus induction, filamentous callus, micropropagule, embryo, *Kappaphycus alvarezii*

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Bambang Iswanto, Imron, Rommy Suprpto, and Huria Marnis (*Research Institute for Fish Breeding, Sukamandi, West Java*)
Embryonic and larval development of a red strain of the Egyptian African catfish (*Clarias gariepinus* Burchell, 1822)
Ind. Aqua. Journal Vol. 10 No.1, 2015 p: 19-31

Egyptian African catfish is one of several African catfish (*Clarias gariepinus*) strains introduced to Indonesia. Several breeding activities using that strain in Sukamandi resulted in some individuals with redish-yellow body colour (a red strain). Biological informations related to aquacultural aspects of that red strain were still scarce. The present study aimed to elucidate the embryonic and larval developments of the red strain compared to those of the black (normal coloured) one, using the progenies obtained from artificial spawning of each red and black coloured brooders. Results of the present study revealed that embryonic developments of the red and black strains were similar. Their larval development were also quite similar, however, both larvae could be distinguished based on the pigmentation. The red strain larvae were golden-red-yellowish in colour, while the black strain larvae were greyish covered with dense melanophores. Total length of the red strain larvae tended to be lower than those of the black strain.

Keywords: embryo, larva, development, red strain, Egyptian African catfish (*Clarias gariepinus*)

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Rosmiati, Andi Parenrengi, and Emma Suryati (*Research and Development Institute for Coastal Aquaculture, Maros*)
Marine sponge *Aaptos suberitoides*, it's potential source of natural antibacterial for controlling *Vibrio harveyi* on tiger shrimp (*Penaeus monodon*) culture
Ind. Aqua. Journal Vol. 10 No.1, 2015 p: 33-40

The study aims to isolate and identify the natural antibacterial compounds potential from *Aaptos suberitoides* for *Vibrio harveyi* control on tiger shrimp (*Penaeus monodon*) culture. The agar diffusion method using paper discs was used to determine the antibacterial activity of extracts (diethyl ether (DEE), butanol (BUE) and aqueous (HOE) and compounds successfully isolated against *Vibrio harveyi*. Findings showed that the antibacterial activity was concentrated in BUE with the inhibition zone of 17.2 ± 0.1 mm. Meanwhile, two other extracts (DEE and HOE) did not exhibit any antibacterial activity against *V. harveyi*. From the active BUE, it was successfully isolated two compounds giving a strong anti-vibrio activity with the inhibition zone of 22 ± 0.1 mm. The IR, ^1H , ^{13}C , COSY, HMQC, HMBC, and MS spectrum analysis indicated that both active compounds identified as aaptamine (1) and 9-demethyloxyaaptamine (2). The study suggested that marine sponge *A. suberitoides* may have potential compounds source for controlling of *V. harveyi* on tiger shrimp culture.

Keywords: *Aaptos suberitoides*, aaptamine, 9-demethylaaptamine, *Vibrio harveyi*, *Penaeus monodon*

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Vitas Atmadi Prakoso, Jojo Subagja, and Young Jin Chang (*Research and Development Institute for Freshwater Aquaculture, Bogor*)

Low water temperature and its effects on stress response of grey mullets *Mugil cephalus* acclimated in freshwater
Ind. Aqua. Journal Vol. 10 No.1, 2015 p: 41-45

Grey mullet (*Mugil cephalus*) can adapt to saline and freshwater. Although belonged to euryhaline species, but information regarding their stress response on low temperature. Environmental disturbance such as low water temperature may effect their physiological condition. These information can be useful for aquaculture development of this species in freshwater. Therefore, the purpose of study was to investigate the effects of low water temperature on the stress response of grey mullets *Mugil cephalus* acclimated in freshwater. The blood samples of experimental fish (TL: 28.2 ± 1.1 cm, BW: 198.6 ± 25.9 g) were collected during winter season when the water temperature of controlled rearing system was stable at 25°C and uncontrolled rearing system slowly dropped until 12°C. Their stress response on both rearing systems was observed. The results showed that low temperature affected to lower the behavior activity and increase the stress response of grey mullets. The breath frequency of grey mullet regarding their opercular movement at 12°C was 74-97 breath/min., while at 25°C it was 95-114 breath/min. Hematocrit (Ht) and hemoglobin (Hb) were shown higher values of 43.5% and 9.5 g/dL, respectively at 25°C than 12°C (28.0% and 7.1 g/dL, respectively). The tendencies of cortisol and glucose level increased with the lowering temperature, showing higher value of 264.8 ng/mL and 35.5 mg/dL in 12°C than 5.5 ng/mL and 32.7 mg/dL in 25°C. The chemical properties of blood in grey mullets showed same tendency comparing between 12°C and 25°C, there was no significant different between each temperature, except for chloride ($P < 0.05$). Chloride value was higher at 25°C, while other blood components such as osmolality, sodium, potassium, and magnesium were showing no significant differences. However, the results showed lower values at 12°C in every blood components, except for chloride. In conclusion, lowering water temperature to 12°C had impact as stressor to the behavior and stress response of grey mullets acclimated in freshwater.

Keywords: temperature, stress response, grey mullet, *Mugil cephalus*, freshwater

UDC 613.27

Asda Laining, Lideman, and Shunsuke Koshio (*Research and Development Institute for Coastal Aquaculture, Maros*)

Interaction between dietary mineral and phytase on biological performances of Japanese flounder, *Paralichthys olivaceus*. Part II. Mineral digestibility and vertebral mineral content

Ind. Aqua. Journal Vol. 10 No.1, 2015 p: 47-55

Interactive effects between dietary inorganic phosphorus (IP) and phytase (P) on mineral digestibility and vertebral mineral content were investigated in a 30 days feeding trial followed by three weeks digestibility trial with Japanese flounder, *Paralichthys olivaceus*. Eight experimental diets were formulated based on two levels of dietary Ca at 0% and 0.2% combined with either 0% or 0.25% of dietary IP and either with 0 and 2,000 fytase unit (FTU)/kg of phytase in diet, respectively. Result indicated that digestibility of total phosphorus significantly increased by three dietary compounds where the highest was observed in fish fed diet contained 0.25% IP and 2,000 FTU phytase/kg and dietary Ca also included in diet. Significant interaction was only detected between dietary IP and P on this parameter. Supplementation of IP and Ca not phytase significantly improved Ca digestibility. Ca digestibility was very poor when dietary IP and Ca were not supplemented in diet even with when phytase supplemented in diet. There was significant interaction between dietary IP and Ca on Ca digestibility. Vertebral total phosphorus, Ca, and Mg content as well as Ca:P ratio were significantly enhanced by dietary IP and phytase. Dietary Ca has significant effect only on vertebral total phosphorus. Interaction between dietary IP and Ca was significantly found on vertebral Ca content and Ca:P ratio. No significant second-order interaction was observed among the three dietary mineral on overall parameters. Based on total phosphorus and Ca digestibility as well vertebral phosphorus content found in this study, dietary IP, Ca, and phytase at rate of 0.25%, 0.2%, and 2,000 FTU phytase/kg diet, respectively are needed to supplement in diet for a better mineral absorption and bone mineralization.

Keywords: mineral, phytase, digestibility, vertebrae, Japanese flounder

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Asda Laining, Rachman Syah, and Muslimin (*Research and Development Institute for Coastal Aquaculture, Maros*)

Potential use of organic mineral as mineral source for diet of juvenile vannamei shrimp, *Penaeus vannamei*

Ind. Aqua. Journal Vol. 10 No.1, 2015 p: 57-63

The use of organic mineral (OM) has been recently introduced in aquaculture both as feed supplement and water quality improvement. A feeding experiment was conducted to evaluate a response dose of OM on growth, survival, and mineral content in whole the body and carapace of vannamei shrimp (*Penaeus vannamei*). Three diets were supplemented with different levels of organic mineral at 1 (OM1), 2 (OM2) and 4 (OM4) g/100 g diet. Positive control was a diet without OM inclusion but supplemented with commercial mineral mixture at level of 4 g/100 g diet. Juvenile vannamei shrimp with average initial body weight of 3.5 ± 0.1 g were stocked into 12 tanks with a capacity of 200 L. After 75 days feeding trial, highly significant weight gains was observed in shrimp fed OM at all levels compared to the positive control. However, no significant differences were found among dietary OM groups. The growth response was clearly shown by the same values of SGRs in the three OM supplemented groups (1.1%/d) and only differed significantly from positive control. Increasing of dietary OM significantly improved survival rate of shrimp where the highest was observed in group fed OM1 and the lowest was in control diet. Effect of dietary OM on whole body Ca and P were quite similar while whole body Ca and P content of OM1 group was slightly high and tended to decrease in two groups with higher level dietary OM. However, no significant differences among the treatment groups. A clear response of supplementing OM in diet was detected on whole body Zn content. Increase of dietary OM resulted in an increase of Zn content in whole body. The effect was clearly shown when diet contained 2% and 4% OM. Carapace Ca content was highly significant when diet contained 2% OM. Similar to whole body Zn content, there was also a linear trend of response dose of dietary OM on carapace Zn content which the highest was found in dietary OM4. Based on growth, survival rate, and Zn content in whole body and carapace, dietary OM at 1 g/100 g diet can replace mineral mixture as mineral source in diet of vannamei shrimp.

Keywords: organic mineral, carapace mineral, growth, vannamei shrimp

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Arief Taslihan, Richard Callinan, Jenny-Ann Torribio, Bambang Sumiarto, and Kamiso Handoyo Nitimulyo (*Main Center for Brackishwater Aquaculture Development, Jepara*)

Cluster model for extensive giant tiger shrimp (*Penaeus monodon* Fab.) to prevent transmission of white spot syndrome virus
Ind. Aqua. Journal Vol. 10 No.1, 2015 p: 65-70

White spot syndrome virus (WSSV) has become epidemic in Indonesia and affecting shrimp aquaculture interm of its production. White spot syndrome virus is transmitted from one to other ponds, through crustacean, included planktonic copepode as carrier for WSSV and through water from affected shrimp pond. A cluster model, consist of shrimp grow out ponds surrounded by non-shrimp pond as a role of biosecurity has been developed. The model aimed to prevent white spot virus transmission in extensive giant tiger shrimp pond. The study was conducted in two sites at Demak District, Central Java Province. As the treatment, a cluster consist of three shrimp ponds in site I, and two shrimp ponds in site II, each was surrounded by buffer ponds rearing only finfish. As the control, five extensive shrimp grow out ponds in site I and three shrimp grow out ponds in site II, with shrimp pond has neither applied biosecurity nor surrounded by non-shrimp pond as biosecurity as well considered as control ponds. The results found that treatment of cluster shrimp ponds surrounded by non-shrimp ponds could hold shrimp at duration of culture in the grow out pond (DOC) 105.6 ± 4.5 days significantly much longer than that of control that harvested at 60.9 ± 16.0 days due to WSSV outbreak. Survival rate in trial ponds was $77.6 \pm 3.6\%$, significantly higher than that of control at $22.6 \pm 15.8\%$. Shrimp production in treatment ponds has total production of 425.1 ± 146.6 kg/ha significantly higher than that of control that could only produced 54.5 ± 47.6 kg/ha. Implementation of Better Management Practices (BMP) by arranging shrimp ponds in cluster and surrounding by non-shrimp ponds proven effectively prevent WSSV transmission from traditional shrimp ponds in surrounding area.

Keywords: giant tiger prawn, extensive shrimp pond, shrimp pond biosecurity, cluster management shrimp pond

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Muharijadi Atmomarsono and Endang Susianingsih (*Research and Development Institute for Coastal Aquaculture, Maros*)

Effect of different probiotic bacteria on survival rate, growth, and production of whiteleg shrimp in traditional-plus technology
Ind. Aqua. Journal Vol. 10 No.1, 2015 p: 71-79

Instead of culturing tiger shrimp that is frequently burdened by mass mortality, whiteleg shrimp (*Litopenaeus vannamei*) is then considered as an alternative commodity in Indonesian brackishwater ponds. To prevent the whiteleg shrimp from diseases, different probiotic bacteria were tested in completely randomized design experiment using nine 250-m² experimental ponds stocked with 10 PLs of whiteleg shrimp fry/m². Three treatments were applied, namely A) alternate use of probiotic bacteria RICA-1, RICA-2, RICA-3; B) alternate use of probiotic bacteria RICA-4, RICA-5, RICA-3, and C) control (without probiotic bacteria); each with three replications. After 11-week application, the results showed that the best survival rate of whiteleg shrimp was achieved by treatment B (98.83%) and the best production was achieved by treatment A (23.52 kg/250 m²). However, there were no significant differences ($P > 0.05$) among the three treatments tested for the shrimp survival rate. The whiteleg shrimp production in treatment A and B were significantly better ($P < 0.05$) than that in treatment C (control). These high shrimp production in treatment A and B were mainly caused by the capability of the applied probiotics in controlling some water quality variables and *Vibrio* numbers.

Keywords: probiotic bacteria, prevention, whiteleg shrimp, production

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Brata Pantjara, Muhammad Nur Syafaat, and Anang Hari Kristanto (*Research and Development Institute for Coastal Aquaculture, Maros*)

Effect of dinamical water quality on shrimp culture in the integrated multitrophic aquaculture (IMTA)

Ind. Aqua. Journal Vol. 10 No.1, 2015 p: 81-90

One of the technologies to improve the productivity of shrimp farms are environmentally friendly shrimp farming multitrophic integrated system known as Integrated Multitrophic Aquaculture (IMTA). The aims of the study were to observe the water quality dynamic on the integrated multitrophic aquaculture and the effect on the production. This study was used four plots which each of pond had 4,000 m² in sizing, located in experiment pond, at Research and Development Institute for Coastal Aquaculture, Maros. The main commodities used were tiger and vannamei shrimp. In the A pond was cultivated the tiger shrimp with density 12 ind./m², in B pond was tiger shrimp with density 8 ind./m², C pond was vannamei shrimp with density 50 ind./m², and D pond was vannamei shrimp with density 25 ind./m². Other commodities were red tilapia (*Oreochromis niloticus*). Each pond had stocking density 2,400 ind./plot which was divided into 5 hapas having a size of (6 m x 4 m x 1.2 m)/each, mangrove oysters (*Crassostrea iredalei* and *Saccostrea cucullata*) with density 7,500 ind./4,000 m² and seaweed (*Gracilaria verrucosa*) of 500 kg/4,000 m². The observation of dynamic water quality in the pond was conducted every day i.e. temperature, dissolved oxygen, salinity, and measured pH, while the total organic matter total (TOM), total ammonia nitrogen (TAN), nitrite, nitrate, phosphate were taken every two weeks. The measurements methods of water quality in laboratory was referred to APHA (2008); and Boyd (1990). During the study, absorption of N and P in seaweed were measured, the obtained plankton was identified and the ratio of carbon and nitrogen during the observation was also calculated. To determine the effect of dominant water quality on production was used the principal component analysis (PCA). The result showed that water quality during the study was suitable for shrimp and red tilapia culture. The dominant water qualities which effected the shrimp production in IMTA system were total ammonia nitrogen (TAN), oxygen, total organic matter (TOM), phosphate, and salinity. The survival rate of the tiger shrimp in intensive pond and semi intensive pond was 50.68% and 59.28% respectively, while the survival rate of the vannamei shrimp in intensive and semi intensive was 71.26% and 68.06% respectively. The highest shrimp production in the cultivation of IMTA reached was 1,488 kg/pond (3,720 kg/ha) in C pond. The lowest feed conversion ratio (FCR) was obtained in the D pond (0.89). The highest production of red tilapia in IMTA reached in C pond (426.65 kg/pond).

Keywords: water quality, shrimp culture, integrated multitrophic aquaculture

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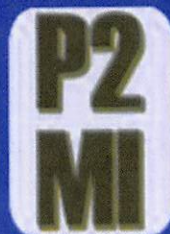
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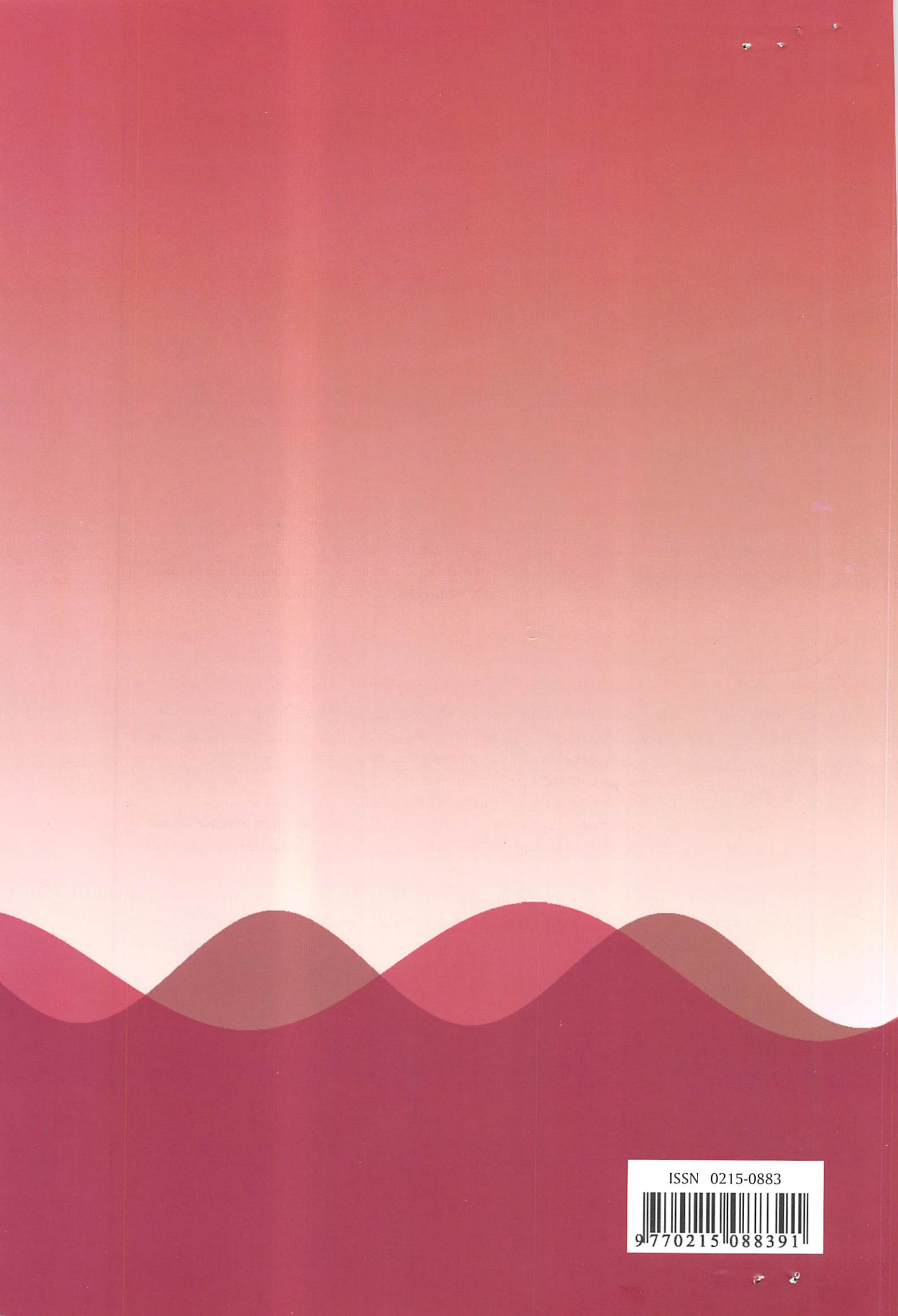
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