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Dear readers,

Welcome to the first newsletter of Research Institute for Aquaculture No.1 in this new Dragon Year.

Year 2012 will be an important year in development history of RIA1. We have said goodbye to our Director - Dr Le Thanh Luu, who retired early this year. Dr Luu has made a very important contribution to the development of RIA1 in particular and aquaculture sector in general. On behalf of all staff at RIA1, I would like to thank Dr Luu for his contribution and wish him all the best. From now a young generation of leaders takes lead of the institute with great responsibilities and hope.

Even though there will be a lot of difficulties and challenges, I do believe that with the common efforts of the staff, we will have success and reach all important targets in developing human resource, research, international affairs and education to bring the RIA1 to higher level.

I would like to wish you all a successful year with health and happiness.

Phan Thi Van
RIA 1 annual meeting - 2011 activities review and 2012 workplan discussion

Hoang Thuy

On the 9th of January 2012, the annual meeting of the Research Institute for Aquaculture No.1 (RIA 1) was organized at the meeting hall in order to review the 2011 activities and discuss the 2012 work plan. The leadership board of the meeting included Dr. Le Thanh Luu- director, Dr. Phan Thi Van, Dr. Tran Dinh Luan vice director and Ms. Nguyen Thi Thieu Anh - President of Trade Union. Attending conference, there were representatives of Directorate board, Communist Party, and all staff of RIA1’s departments, centres and sub-institute.

On behalf of Directorate board, Vice Director Dr. Phan Thi Van presented the summary report of the 2011 activities and tasks of 2012. In 2011, fisheries faced to many difficulties and challenges but with the solidarity, RIA1 has raised the sense of initiative and creativity to find positive solutions in order to complete an enormous amount of tasks such as: scientific research, consultancy, technology transfer, training, international cooperation, etc. However, the report has also shown the RIA1’s shortcomings that need to be resolved in the future. There was also a period of time for officers and staffs to discuss and comment on the report, to give supplementary ideas and developing plans for RIA1 in 2012 and long-term orientations for next years. Also in this meeting, Ms. Nguyen Thi Thieu Anh - Chairman of RIA1’s Trade Union presented the report on trade union’s activities in 2011. And then Mr. Tran Van Chi - the Deputy Chief of RIA1’s Secretariat announced the rewarding decisions for excellent individuals in 2011.

At the end of the meeting, Dr. Le Thanh Luu has given his assent to the report and comments. He appreciated the achievements in 2011. Besides, the director has also given urgent requirements that need to be focused on and done in 2012. Translated by Minh Hau and Hoang Thuy

Announcement ceremony of the Decision on Appointment new Leader of RIA1

Hoang Thuy

The announcement ceremony of the Decision on Appointment Deputy Director Phan Thi Van as new Leader of RIA1 was held at the head office on 30th January 2012.

Participating in the ceremony, there were Mr. Vu Trong Ha, member of Communist Party Committee of Ministry of Agriculture and Rural Development (MARD) - Head of Organization and Personnel Department (DOP), Mr. Nguyen Van Nam, Deputy Head of DOP and other officer in DOP.
RIA1, members in Communist Party Committee, Leader Board, Trade Union Committee, Ho Chi Minh Communist Youth Union; Head of Departments; Centres and Sub-Institute also attended this ceremony.

On behalf of Minister of MARD, Mr. Nguyen Van Nam - Deputy Head of DOP officially announced the Decision No. 141/QĐ-BNN-TCCB signed January 20th 2012, in which MS. Phan Thi Van, Deputy Director of RIA1, was appointed responsible for RIA1. Mr. Vu Trong Ha, Head of DOP has awarded Leader Appointment Decision with congratulation flowers to Ms. Phan Thi Van and wished her to do her responsibilities well in her new position.

In his congratulation speech, Mr. Vu Trong Ha appreciated the fruit of solidarity of RIA1’s collective, which has brought RIA1 to be one of the Leading Aquaculture Research Institute not only in Vietnam but also in Southeast Asia. Contributing to this achievement, all staffs of RIA1, especially Ms. Phan Thi Van, have been putting effort into the Institute and fulfilling task given excellently. With the high approval rate from the Communist Committee and Leader Boards of the Institute, he affirmed that the Ministry fully agreed and appointed Ms. Phan Thi Van to be responsible for the Institute. He hopes that in the future Ms. Phan Thi Van will successfully implement the assigned tasks and RIA1 will become one of the leading aquaculture Institute in Asia and over the world.

Speaking at the ceremony, Deputy Director - Ms. Phan Thi Van thanked the Ministry of Agriculture and Rural Development, RIA1 leaders and colleagues for creating favourable conditions for her to strive to complete the task. Especially, Ms. Phan Thi Van expressed deep thanks and appreciation to Dr. Le Thanh Luu - Director of RIA1, Dr. Nguyen Huu Ninh and Dr. Tran Dinh Luan - Deputy Director of RIA1 for their enormous encouragement, cooperation and endorsement in the past. She promised to continue striving and doing better on her mission and wished to continue receiving these supports from the leaders of the MARD as well as the cooperation of Leader Board and colleagues of RIA1.

Speaking for RIA1’s Leader Board and Staff, Dr. Le Thanh Luu - Director and Dr. Tran Dinh Luan - Deputy Director gave his best congratulations and wishes to Dr. Phan Thi Van. This appointment was said to be not only an honour but also the Ministry expressed its confidence in the contribution of Ms. Phan Thi Van in the work course.

The Appointment Decision came into effect on February 01st 2012. Translated by Pham Thuy Duong
Join hands to combat climate change

Hai Dang

The workshop was funded by FAO and the Government of Japan, and was hosted by the RIA1 through a letter of agreement with this institution. The workshop took place in Ho Chi Minh City during 8 - 10 February, 2012 with the participation of Ms. Yuriko Shojii - FAO representative, Ms. Phan Thi Van - Director in charge of RIA1, and domestic and international experts.

View of workshop. Photo Hai Dang

Many years, inland fisheries and especially aquaculture is becoming one of the most important livelihoods and income sources in the Mekong Delta. But rapid growth leads to many hugely diverse consequences taking place in increasingly larger scale, including climate change.

In general, the assessment of Vietnam’s vulnerability to climate change was rated among the top five nations likely to be affected due to its geographical location and long low lying and deltaic coastline. In the Mekong Delta per se Bac Lieu and Ca Mau provinces, located in the Southern cape on the Ca Mau peninsula, where the farmers’ livelihoods are mostly dependent on aquaculture and fisheries, are thought to be among the most vulnerable to climate change impacts.

Thus, this workshop was organized with the objectives: To create awareness of climate change issues in relation to aquaculture and fisheries dependent livelihoods in Viet Nam’s Mekong Delta and in other relevant areas of the country, starting from the biophysical changes expected and continuing on to the direct and indirect impacts on aquaculture and fisheries communities in the region; and benefitting from past adaptation experiences (including traditional knowledge) in the country, to identify and prioritize potential adaptation mechanisms, knowledge gaps and the next steps that should be taken by the private sector, non-governmental organizations, researchers, governments, regional and international organizations towards building resilience especially at the community and national levels; and experts discuss and agree on follow up actions including the development of a GEF project identification form (PIF) that can be submitted to SCCF funding in order to enable adaptation in the fisheries and aquaculture sector in Viet Nam in line with national climate change priorities.

利亚1 celebrated 102th anniversary of International Women’s Day

Hoang Thuy

On 8 March 2012, the 102th anniversary of International Women’s Day was held in RIA1. Attending the meeting, there were representatives of RIA1’s Party, Directorate, the Executive Board of
News

Trade Union and Youth, the Veteran and all women and students working and studying in RIA1.

Ms. Nguyen Thi Ha, Vice president of RIA1’s Labour Union, Head of Women Group opened the meeting by presenting “Report of Women’s activities in 2011”. In her speech, she said 100% of RIA1’s women attaining “the two good women’s title” in 2011, 4 ones nominated to receive the merit of excellent unionist and 14 ones awarded in the movement of “Complete work as well as take care of a home and family” from Vietnam National Union of Agriculture and Rural Development Workers

RIA1 is an office specializing in research so it is not easy to select contents and forms of art activities for female staffs. However, these are done well by the Executive Board of Labour Union and especially Women Group in RIA1. Consequently, RIA1’s women enthusiastically participated in the activities such as the meeting with theme “The life of female scientists of RIA1 in foreign countries”, the best singing competition of RIA1’s women, badminton competition and female football, etc. Besides, many charity activities were organized by Women Group in order to help disadvantaged people.

The competitions of “Fashion for Work” and “Talent” such as singing, dancing and plays of Departments took place after the meeting. These items which were prepared elaborately and suitable for their works and lives. Audiences and candidates had a happy and cheery time together.

At the end of the meeting, on behalf of men staff of RIA1, Vice Director Tran Dinh Luan wished women will have a special day full of flowers, gladness and care.
Thirty - first FAO regional conference for ASIA and the Pacific

Nguyen Huu Nghia, Hoang Thuy

12 - 16 March 2012 Food and Agriculture Organization - UN (FAO) held the 31st session of Regional Conference for Asia and the Pacific in Hanoi with hundreds of delegates from over 40-member countries aiming to improve food security and reduce poverty.

The Regional Conference for Asia and the Pacific is held every 2 years. In this session, food security and poverty reduction for the countryside were set as critical issues.

Currently, there are nearly 1 billion people worldwide suffering from hunger in which above 60% are living in the Asian - Pacific region. It is a challenge to halve extreme poverty and hunger by 2015. Food export policies, oil price increases, use of food for bio-fuel production and climate change are factors which made the food price double for the past 10 years, hence affecting the poor seriously. In the conference, participants discussed to find macro solutions for the region in order to increase food production and support the poor with sustainable livelihood.

According to Minister of Ministry of Agriculture and Rural Development (MARD), Mr. Cao Duc Phat, to obtain the goals it is necessary to have efforts at regional and international level. Vietnam is going to contribute to this task by improving research activities in agriculture, reducing post-harvest loss and better managing water and land resources.

In this conference, Research Institute for Aquaculture No.1 was assigned by MARD to be responsible for a fisheries product showroom. There were 6 demonstration tanks to show more than 20 species which are economically valuable for fresh, brackish and marine water aquaculture such as fish (Pangasius, Tilapia, Trout, Sturgeon, Grouper, Cobia…), shrimp (Black tiger shrimp, Lobster…) and Mollusc (Oyster, Hard Clam, Snout Otter Clam…).

Besides the live specimens above, there were 12 posters on culture technologies for important species, achievements in aquaculture, fisheries, processing and export in the past years. Moreover, the dry specimens and fishing boat models were also presented in the showroom. Furthermore, documentary films in both English and Vietnamese on fisheries extension programs were displayed and RIA1’s newsletter was distributed free to delegates during the conference time.

The showroom attracted the delegates and international officials that created a basis for further cooperation. The Minister Cao Duc Phat and the Vice Minister Bui Ba Bong visited the showroom several times and gave their guides and appreciation.
The showroom was honoured to welcome the Prime Minister Nguyen Tan Dung, Mr. José Graziano da Silva, Director-General of FAO and Minister of MARD Mr. Cao Duc Phat visiting on 15/3/2012.

*Translated by Nguyen Van Khanh*

**The 81st anniversary of Ho Chi Minh Communist Youth Union in RIA1**

*Minh Hau*

The meeting on the 81st anniversary of Ho Chi Minh Communist Youth Union was held on 26th March 2012 in RIA1.

The guests of honour were representatives of Communist youth union of Tuson town and Youth business association of Fishery college; RIA1’s representatives were Secretary of RIA1’s Communist Party - Vice Director Tran Dinh Luan; Deputy Secretary of Communist Party Mr. Nguyen Tien Sy; Mr. Nguyen Van Tien - Head of Applied Biology Department; Mr. Mai Van Tai - Director of CEDMA and all members of RIA1’s Ho Chi Minh Communist Youth Union.

On behalf of RIA1’s Directorate board Mr. Tran Dinh Luan highly appreciated the achievements of the Youth Union in recent times and showed few weaknesses which should be solved in the future. Secretary of Communist Youth Union of RIA1 - Ngo Phu Thoa promised to promote the strength of RIA1’s Youth in order to contribute to RIA1’s development, especially will cooperate with RIA1’s Communist Party, the Communist Youth Union of Tuson town and MARD participating in the volunteer movements concerning aquaculture to help poor people in rural regions.

In connection with the anniversary, Communist Youth Union of RIA1 organized the man football competition from 19th to 27th March. There were 4 teams including Genetics Department; Applied
Biology Department; CEDMA&ICED; Centre for Aquaculture Engineering and Transfer of Technology participating in the competition. Opening the competition, Nguyen Thi Ha, Deputy Chairman of RIA1’s Trade Union handed out flowers, encouraged and took photos with the teams. The matches were so exciting and many nice goals were scored which satisfied spectators. In the end, the team of Genetics Department won the championship; Applied Biology Department was in the second place. **Translated by Minh Hau and Hoang Thuy**

**Summarization conference on the activities of RIA1’s Veterans Association in 2007 - 2011 stage and action plan for period of 2012 - 2017**

*Minh Hau*

On the 27th March 2012, RIA1’s Veterans held the second conference in order to summarize activities in the 2007 - 2011 stage and action plan for period of 2012 - 2017.

**View of meeting. Photo Minh Hau**

Attending conference, there were representatives of RIA1’s Communist Party including Secretary, Vice Director Tran Dinh Luan; Deputy Secretary, Head of Administrative Office Mr. Nguyen Tien Sy; Head of Applied Biology Department Mr. Nguyen Van Tien and all veterans of RIA1. Mr. Le Quang Tai, president of Veterans Association of Tuson town was the guest of honour.

At the conference, Mr. Bui Huy Cong, president of Veterans Association of RIA1 presented a report summarizing the 2007 - 2011 stage, after that participants voted for the second executive committee in the 2012 - 2017 stage. The conference also gave an action plan for the next term and reviewed tasks that not were completed in the 2007-2011 stage, it is important to try and learn from experience. In which, waste, corruption and bureaucracy resistance is the key mission; every veteran will respond to the “Study and follow Ho Chi Minh’s moral sample” campaign. **Translated by Minh Hau and Hoang Thuy**

**Farewell Director Le Thanh Luu on the occasion of his retirement**

*Hoang Thuy*

On the 23rd March 2012, RIA1 held a farewell meeting with Director Le Thanh Luu.

There were representatives of Party Committee, Trade Union, Directorate Board, Youth, Veteran and Heads of Departments, Centres and Sub-Institute in the meeting. Mr. Pham Manh Tuong - former Director, Mr. Thai Doan Ung - former Party’s Secretary, Mr. Nguyen Dang Vien - former Vice Director and Mr. Niels Svennevig - Senior Technical Advisor of NORAD project were the guests of honour.
At the meeting, Dr. Luu’s pictures expressing his career as well as research activities were shown. He has contributed enormously to the current success of RIA1 for nearly 40 years.

On behalf of the Directorate board as well as all staff of RIA1, Dr. Phan Thi Van - Leader of RIA1 handed out bouquets and souvenirs to Dr. Luu and expressed the sincere thanks to him, for his dedication to RIA1. He will be greatly missed by RIA1’s staff; we wish him all the best, good health and happiness, and we look forward to our ongoing collaboration with him in the future.

Representative for young generation and old students of AIT classes, MSc. Nguyen Thi Dieu Phuong, Deputy Head of Applied Biology Department given their respect and gratefully to Dr. Le Thanh Luu and she was presenting a poem

GRATEFULLY

Dedicated to Dr. Le Thanh Luu

For whoever remembered about Tu Son
RIA1 is well known
The leaders are good minded
Dr Le Thanh Luu has a higher strategy.

He had great contributions,
Leading RIA1 to the success although facing many difficulties
Like a boat crossing over waves of the East sea
Steering RIA1 to reach global success.

Research cooperation and education within Asia and Europe
Development of long-term strategy for Aquaculture of Vietnam
Party and country recorded his contributions
Many young research staff became leaders and successfully.

Time is passing gradually,
Gratefully enclosing him always in our hearts
Wishing him health and well-being
Always been a good leader, supporting orientation to the young generation.

By Nguyen Thi Dieu Phuong, Nguyen Thi Hanh Tien
Integration of western king prawn and seaweed or mussel in an integrated recirculating aquaculture system

Le Van Khoi

Intensive aquaculture may cause negative impacts on the aquatic environment by causing water pollution, algae bloom and reduction in biodiversity of the surrounding aquatic environment. The nutrient-rich effluents from aquaculture activities contain nitrogen and phosphate which serve as a nutrient source for bivalve, algae and invertebrates. The research has explored the nutrient uptake capacities of green seaweed (Ulva lactuca) and blue mussel (Mytilus edulis) integrated with western king prawn (Penaeus latisulcatus) in the integrated closed recirculating aquaculture systems (IRAS) and has evaluated the nutrient retention of the seaweed and animals in the system.

One experimental unit of an IRAS consisted of three tanks: a treatment tank, a prawn tank and a waste-collection tank. The treatment tank and the prawn tank were set on the top and lower tiers of a metal frame; the waste-collection tank was on the floor. Water was pumped from the waste-collection tank to the treatment tank by a submersible pump, circulated to the prawn tank and then returned to the waste-collection tank through gravity. Seaweed was stocked into the treatment tanks in the integrated culture experiment of the prawn and seaweed. Similarly, mussels were stocked into the treatment tanks in the experiments of the prawn and mussels integration.

A series of experiments were conducted under laboratory conditions to investigate the water quality; survival, growth of western king prawn and nutrient budget in the IRAS. The research results proved that the recirculating culture system could maintain acceptable water quality for western king prawn at stocking densities till 16 prawn m\(^{-2}\) and at feeding rate of 3.0% of wet weight biomass. Increasing the stocking densities results in decreasing the water quality in the culture media, the growth and survival of western king prawn reared in the recirculating aquaculture system. In contrast, increasing feeding rate did not improved growth and survival rate of western king prawn but feed utilization efficiency decreased significantly with increasing the feeding rates. Total phosphorus (TP) and orthophosphate (PO\(_4^{3-}\)) concentrations increased linearly with increasing the feeding rates of western king prawn.

High percentage of nutrient inputs accumulated into tank bottom at higher stocking densities whereas over 50% of nutrient inputs were in discharged water at harvest in lower stocking densities.
Inclusion green seaweed into western king prawn culture system improved the water quality in the IRAS. Concentrations of total ammonia nitrogen (TAN), nitrate ($\text{NO}_3^-$) and $\text{PO}_4^{3-}$ in the integrated culture system were lower than those in the monoculture system. Green seaweed effectively removed 24.02-99.05% TAN and 13.80-96.40% $\text{PO}_4^{3-}$ in the culture media. Feed utilization efficiency in integrated culture was significantly enhanced by 24.90 % nitrogen (N) and 19.41% phosphorus (P). Nutrient budget revealed that western king prawn and green seaweed retained 28.00-31.90% and 6.53-29.71% N of total nitrogen (TN) inputs at harvest, respectively while P retention was 13.46-14.63% and 1.62-13.50% of TP inputs, respectively. The rest of total nutrient input was in discharged water and tank sediments.

Integrated culture of blue mussel and western king prawn could improve the water quality in the IRAS though effectively removing of the total bacteria (TB), total suspended solids (TSS) and total nitrogen (TN) in the cultured media. However, concentrations of $\text{NO}_2^-$, $\text{NO}_3^-$ and $\text{PO}_4^{3-}$ were increased due to the mussel excretion. Growth and survival of western king prawn were not affected by adding blue mussels into western king prawn culture in IRAS at stocking rate of 250 mussel m$^{-2}$ and 16.07 prawn m$^{-2}$. When stocking rates exceed density of 312.5 mussel m$^{-2}$ and =21.36 prawn m$^{-2}$, growth and survival of both western king prawn and blue mussel in the IRAS were declined significantly due to the low water quality and crowded effects in the culture media. Inclusion of blue mussels into western king prawn culture was enhanced the feed utilization efficiency further up to 10.63 % N and 4.89 % P and reduced the nutrient discharged through draining at harvest.

N and P contents accumulated in mussel tanks increased linearly with the increasing mussel stocking densities in the IRAS. The results indicate that the use of integrated aquaculture system is a step forward to achieve sustainability in aquaculture.

**Reviewed by Prof. Graeme Robertson**

**Research and application of Bioflocs technology for intensive culture white leg shrimp Litopenaeus vannamei**

**Nguyen Thi Thu Hien**

Biofloc technology (BFT) application in aquaculture is considered as a new method to approach biotechnology (Avnimelech, 2006) base on fundamental principles of sludge suspended activated. It seems to be a good solution to solve two matters (1) removing metabolic nutrients into heterotrophic bacteria biomass to treat water ponds, (2) Biofloc is used as a feed supplement for shrimp. The BFT contributes to reduce the cost of feed for aquaculture. It is also aimed as a solution to develop sustainable aquaculture.
In this study we have conducted experiments to investigate the appropriate C/N ratio and nitrogen which are converted into microbial biomass and determine the optimal threshold parameters that affect the development of Biofloc.

The experimental C:N ratio were carried out in circular composite tanks which were placed out door and rectangular tanks placed in door, a volume of 3 - 5 m$^3$ each. We used two carbon sources (molasses and starch) and three C:N ratio of 10:1 (CN10); 12:1 (CN12) and 20:1 (CN20). The tanks were cleaned to ensure standards biosafety adopted. Size of white leg shrimp experiment was PL15 and stocking density of 120 ind/m$^3$. Using CP pellets feed (>40% Protein) to grow shrimp with amount from 15 % to 20 % biomass. Experiment period was 90 days.

The water temperature, pH, dissolved oxygen (DO) may affect the Biofloc so they were monitoring. The water parameters including temperature, pH, DO, salinity, turbidity measured daily at 9 - 10 am and 2 - 3 pm. Water temperature and DO measured by YSI 5100 meter (USA); pH by YSI 5500 meter (USA); Salinity by Atago meter (Japan) and turbidity by Secchi plate.

Filtered water samples by GF/C Whatman and analysis within the day of sampling. The monitoring and analysed water quality parameters were Nitrite ($\text{NO}_3^-$ - N) by Cadmium column method; nitrite ($\text{NO}_2^-$ - N) by reagents Gressi method; total ammonia nitrogen (TAN) by Nessler method; Phosphate by ascorbic acid method; Total Nitrogen by Kjeldahl method. For ash contents, a known amount of dry sample was burnt in a muffle furnace at 550$^\circ$C for 4 h and the ash cooled and weighed. The crude protein content was determined by the Kjeldahl method.

Lipid content was determined with Soxhlet apparatus. The analysis followed standard methods (APHA, 1995).

Bioflocs samples were analysed mud sediment. After filtering water for nutrient analysis, the pre-dried and weighed filter paper containing suspended materials was dried in an oven until constant weight. Total Organic Carbon (TOC) were analysed by method of El Wakeel and Riley (1957). Total suspended solids (TSS) were calculated from the weight differences before and after the dried samples at 105$^\circ$C. Total volatile suspended solid (VSS) and biochemical oxygen demand (BOD$_5$) of water were measured on a weekly basis following Stirling (1985). The VSS level is considered as a measure of bacterial concentration in wastewater systems although other particulate and dissolved organic matter included in the present experiment. Volume Floc Index (VFI) collected by Imhoff and cylinder, with 1000ml, deposition 30 minutes, read Floc volume.

C:N ratio is evaluated through some parameters Biofloc: FVI, TSS, VSS and parameters of water
quality assessment (TAN, NO₂⁻); technical shrimp culture parameters such as food conversion ratio (FCR), growth and survival.

The experiment results of CN10, CN12, CN20 shows that TSS volume in CN12 is lower than that of CN10, CN20. TSS volume from 0.1 to 0.75 mg.l⁻¹ is acceptable; the optimal TSS value is below 1 g.l⁻¹. Similar to TSS, VSS volume is stable. FVI of Biofloc, in CN10, is low and it reaches its peak with CN20 (15ml.l⁻¹). At this factor, Floc is dense. At CN12, TSS is the lowest and VSS have best linear. FVI is observed at highest between 10-12 ml.l⁻¹. Thus CN12 could be selected for the application of BFT to culture white leg shrimp in tanks

BFT aims at controlling nitrogen load up so the observed water quality parameters should be TAN and NO₂⁻. The result shows that TAN concentration in experiment is always less than 1mg.l⁻¹. In comparison with TAN concentration in outdoor pool, the concentration of TAN in CN12 is the lowest (0.2-0.4 mg.l⁻¹) and it starting to increase in the 2nd month of culture. Nitrit concentration goes up in 5 weeks then reduced cycle. Nitrite concentration higher was results metabolism of nitrogen. However, if nitrate concentration is above 5mg.l⁻¹ (exceed the level standard), Nitrite controlling solution is needed.

From all experimental CN ratios, it can be found that FCR of CN ratios ranged from 0.70 to 0.87. The survival of shrimp is over 80% in all experiments. Weight and growth of shrimp in CN20 treatment are lower than that of CN10 and CN12.

CN12 could be selected for application BFT technology to culture white leg shrimp. Evaluating the influence of water parameters (temperature, pH, DO, organic carbon resources) to the development of Biofloc includes: Biofloc parameters (FVI, TSS, VSS) and its quality (Protein, Lipid and Ash).

Water temperature from 28 to 30⁰C is the most suitable for the development of Biofloc. At lower temperature, FVI factor is under 1ml.l⁻¹. At higher one, it is about 3-3.5ml.l⁻¹. At 29-30⁰C, group of bacteria is in the optimal development condition. Bacterial microbial system is highly active flocculation which motivates FVI factor.

The experiment shows that if pH<7.1, FVI factor is below 0.5 ml.l⁻¹. In many culture tanks, it appears to break links amongst small particles of Floc. FVI value is stable and the optimal value is over 7.3. The research conducted to estimate the influence of pH on Biofloc illustrates that pH 6.8 - 8.5 of carbon, protein and lipid increase when pH increases. PH between 8 - 8.5, the nutrition of Biofloc reaches maximum.

DO concentration in water also directly affects the quality of Biofloc. If DO from 3.5-7.1 mg.l⁻¹, protein and lipid increase when DO increases. The weight of Biofloc is heavier when concentration of dissolved oxygen is higher. That can be explained by the presence of filamentous bacteria, zoogloeal when DO concentration is more than 5 mg.l⁻¹.

Results show that the alkalinity of about 80 - 190 mg.l⁻¹ can not effect Biofloc factors and quality of Biofloc.

C:N ratio of 12:1 (CN12) is the most suitable for white leg shrimp culture. The optimal water conditions are pH 8 - 8.5, DO > 5 mg.l⁻¹, temperature 28 - 30⁰C, TOC 0.4 - 1 mg.l⁻¹. **Reviewed by Dr. Nguyen Huu Ninh**
Initial evaluation of material for genetic selection program of Cobia Rachycentron canadum

Do Xuan Hai

Cobia is appropriate species for cage culture and including off-shore culture. Research has shown that cobia is matured under culture condition and has high larval survival rate. In addition, cobia has a high growth under marine cage culture. Cobia has good meat quality and their processed production can be exported. Research in artificial breeding of cobia started in 1998. Today, standard techniques for cobia seed production and sea-cage farming have been established.

From 2010, the Research Institute for Aquaculture No.1 has conducted a project entitled “Initial evaluation of genetic material for genetic selection program of cobia Rachycentron canadum”. This research is an essential start for future genetic selection program of cobia.

Three cobia group originated from 3 different geographical location were collected in 2010, including 600 fish China (average weight of 90 ± 40g), 600 fish from Taiwan (average size 100 ± 50g) and 600 fish from Vietnam (average size 85 ± 40g) as initial material for genetic evaluation.

Three genetic marker including AFLP, RFLP and microsatellite types have been used for genetic evaluation of different cobia population. The use of results of AFL and RFLP makers did not reveal the genetic differences of the collected cobia population collected. However, the use of microsatellite maker showed the genetic difference among the cobia population.

The three-cobia populations are polymorphic and have different alien frequencies in microsatellite analysis results. Locus Rca1B-F06A and Rca1-A04B is specific for Vietnamese cobia. Locus Rca1-A11A and Rca1B-E09I is specific for Chinese cobia and Rca1-A04A, Rca1-A11A is for specific Taiwanese cobia. Based on genetic analysis, the inbreeding index is highest in Vietnamese cobia (Fis = 0.24), lower in Taiwanese cobia (Fis = 0.075) and lowest in Chinese cobia (Fis = 0.017).

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Vietnamese cobia</th>
<th>Chinese cobia</th>
<th>Taiwanese cobia</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survival rate (%)</td>
<td>54 - 62</td>
<td>41 - 47</td>
<td>46 - 52</td>
<td>One, year</td>
</tr>
<tr>
<td>Specific growth rate (%BW/day)</td>
<td>0.91 - 0.92</td>
<td>0.8 - 0.82</td>
<td>0.82</td>
<td>One, year</td>
</tr>
</tbody>
</table>

*Note: at the end of 2010, the prolonged cold weather period affected on growth and survival rate of collected cobia populations.
The project confirmed that the collected cobia population adapted to the Vietnamese Northern climate condition. Our results reveal the differences in genetics among cobia populations, which are important materials for future genetic selection program of this species. **Reviewed by Dr. Nguyen Quang Huy**

**Discovery of three new species in *Opsariichthys* collected from Dakrong district, Quang Tri province, Vietnam**

**Nguyen Van Hao, Nguyen Thi Hanh Tien, Do Van Thinh and Nguyen Thi Dieu Phuong**

With the total area of about 123.2 km² located in the South West area of Quang Tri province, Dakrong district has the Dakrong River which was selected as a study site in project of Highland Aquatic Resources Conservation and Sustainable Development (HighARCS project). The aquatic resources in Dakrong River are very typical and diversity with 38 fish species, 26 genus, 9 families and 5 orders (Nguyen *et. al.*, 2011). In the species collection from the water bodies of Dakrong district, Quang Tri province, there were some species belonging to *Opsariichthys* also found in the local fish fauna.

The *Opsariichthys* Bleeker, 1863 (Cá Cháo) distributes in the rivers and streams in the north, center, southwest provinces of China (Peiqi *et.al.*, 2000) and in the north mountainous provinces of Vietnam (Mai, 1978). According to Nguyen Van Hao and Ngo Sy Van (2001), there are 5 species belongs to *Opsariichthys*, (Cyprinidae, Cypriniformes) in Vietnam. Not only *Opsariichthys bidens* Günther (Cá Cháo thường) but also 4 other endemic species, *Opsariichthys hieni* Tự (Cá Lòng cong) and *Opsariichthys bea* Tự (Cá Quac) (in Nghe An and Ha Tinh provinces), *Opsariichthys dienbienensis* Hao & Duc (Cá Cháo điên biên) and *Opsariichthys songmaensis* Hao & Duc (Cá Cháo sông mã) (in Dien Bien province and Ma River). There were three new species indentified in the total of 4 collected species in Dakrong district, Quang Tri province. This paper describes the differences of the new species in Quang Tri with the species in *Opsariichthys*.

Eighteen fish samples of *Opsariichthys* were collected by HighARCS project in Dakrong district in May and August 2011. Samples were classified by morphological methods of Pravdin (1973) and Nguyen & Ngo (2001). The fishes were identified following the methods of Mai (1978), Nguyen (1987), Mai et.al. (1992), Nguyen and Nguyen (1995), Nguyen and Ngo (2001) and Kottelat (2001a). In addition, the documents of Peiqi et.al. (2000), Kottelat (2001b) and Rainboth (1996) were used. Samples were compared with the holotype of the fish collection in the Research Institute for Aquaculture No.1, Bacninh.

There were 4 species identified belonging to *Opsariichthys* in Dakrong district, Quang Tri province, *O. bidens* Günther (Cá Cháo thường), *O. dorsoarcus* nov. sp. (Cá Cháo lưng cong), *O. longianalis* nov. sp. (Cá Cháo vây hậu môn dài) and *O. brevistomatus* nov. sp (Cá Cháo miệng ngắn). In which three new species are *O. dorsoarcus* nov. sp., *O. longianalis* nov. sp. and *O. brevistomatus* nov. sp. (see Figures 1, 2, 3). The identification characteristics within three new species discovered
in Quang Tri province are distinguished to the other species of *Opsariichthys* collected in other places that describes in this paper.

The three new species of *Opsariichthys* in Quang Tri are different to *O.hieni* Tu at 40-48 lateral-lines scales; body length 4.3 times shorter than body height; 9-10 fin rays of the anal fin. While, *O.hieni* the anal fin Tu has 33-34 lateral-lines scales; body length 5 times longer than body height and 6-7 fin rays of (Nguyen, 1987).

Regarding to the *O. bea Tu*, the new species are different and distinguished including 3 rows of pharyngeal teeth; 40-45 lateral-line scales; body length 4 times shorter than head length and 6-10 branched rays of anal fin. According to Nguyen (1987), *O. bea Tu* has 2 rows of pharyngeal teeth; 50-54 lateral-line scales and 12 branched rays of anal fin.

Two new species, *O. dorsoarcus* nov sp. and *O. longianalis* nov. sp. are different to *O. songmaensis Hao & Duc* at the small maxilla, thin and long, mouth incision extends after the eye’s border. Whereas, compared species has large and short maxilla, mouth incision lasted before the anterior eye’s border. The *O. brevistomatus Hao & Duc* at short and large maxilla, mouth incision lasted before the anterior eye’s border.

Whereas, *O. dienbienensis Hao & Duc* has open and long maxilla, mouth incision extends after the eye’s border.

In comparison, the *O. dienbiensis Hao & Duc* is different to the *O. dorsoarcus* nov. sp. at dorsal curved edge; the height of dorsal fin shorter than head length; 10-11 gill rankers in I; 41 vertebrae and the swim bladder consists of two gas-filled sacs. Whereas, the compared species has straight dorsal edge; the height of dorsal fin is longer than head length; 6-8 gill rankers in I; 45 vertebrae and the swim bladder normally consists of three gas-filled sacs.

In addition, comparison to the *O. dienbienensis Hao & Duc*, *O. longianalis nov. sp* is different at 41 vertebrae; 18-20 gill rankers in I; swim bladder...
normally consists of two gas-filled sacs; long anal fin of the male, the posterior of anal fin rays ended at the middle of caudal fin and homocercal tail (Lcmax=3,29 Lcmin; Lcmax = the length of longest caudal fin ray; Lcmin = the length of the shortest caudal fin ray). Whereas, the compared species has 45 vertebrae, 6-8 gill rankers in I; swim bladder normally consists of three gas-filled sacs; male fish has shorter anal fin, the anal fin rays ended at the caudal fin base and homocercal tail (Lcmax=2,16 Lcmin).

Comparison different of the *O. brevistomatus* nov. sp to the *O. songmaensis* Hào & Dúc based on: the head length is shorter the body height; 12-13 gill rakers in I; homocercal tail (Lcmax = 3,4 Lcmin), and there is only one big black spot after the gill cover. Whereas, the compared species has the head length is longer the body height; 7-8 gill rakers in I; (Lcmax=2,43Lcmin) and a long black line from dorsal to ventral after the gill cover.

The results of HighARCS study showed that there are three new species as *O. dorsoarcus* nov. sp., *O. longianalis* nov. sp. and *O. brevistomatus* nov. sp. belonging to *Opsariichthys*, which were discovered in the catchment of Dakrong River, Dakrong district, Quang Tri province. The results lead to increasing the number of species of *Opsariichthys* in Vietnam up to 8 species. *Reviewed by Dr. Bui The Anh*
Kick-off meeting of ICA project

Pham Thuy Duong

On January 6th 2012, the kick-off meeting of ICA project (full name: Impacts of Climate changes and adapting bio-security measures for northern Vietnam’s aquaculture) was officially held in Research Institute for Aquaculture No1.

Participating in the meeting, were Dr Phan Thi Van, Vice Director of RIA1, Director of ICA project; Nguyen Huu Nghia, Research Coordinator and GIS and Fisheries resource specialist; Mai Van Tai, Socio-economics, Livelihood; ICA project staffs and PhD, MSc. student. As technical advisors from Denmark, Professor Anders Dalsgaard and Senior Researcher, Dr. Henry Madsen also joined the kick-off meeting of ICA project.

In the meeting, members of ICA project and technical advisors together worked on the work-plan in 2012. According to that, in 2012, the project will start to collect aquaculture maps and take survey on the current use of probiotics and antimicrobials in aquaculture. In addition, in May, the project website will be established.

Project entitled “Impacts of climate changes and adapting bio-security measures for northern Vietnam’s aquaculture” was initially signed on December 6th, 2011 between the Embassy of Denmark and Research Institute for Aquaculture No.1. Being a non-refundable technical assistance of DKK 4.774.689 (US $950.000,00) from DANIDA Fellowship Centre (DFC), Denmark, the target of ICA project is to assess the impacts of climate change to aquaculture in northern Viet Nam and propose adapting measures for sustaining aquaculture development and improving biosecurity. The project will also propose and disseminate mitigation measures of climate change for major aquaculture system to authorities, farmers and other stakeholders.

All the activities and outcomes of the project will be published on RIA1’s website: https://www.ria1.org

Closing workshop of RIA1 - AIDA project

RIA1-AIDA project: “Development of integrated and environmentally sustainable aquaculture as an alternative livelihood for displaced ethnic communities in Vietnam"

Tran Nga

The project is cooperation between RIA1 and AIDA (a Non-government Organization of Spain) that has been co-founded by AECID (The Spanish Agency for International Development Cooperation). It was signed and deployed in order to contribute to the development of sustainable aquaculture, stabilization of the livelihood and reduction of poverty for ethnic
people in three districts of mountainous areas: Na Hang, Lam Binh (Tuyen Quang) and Que Phong (Nghe An). The project was implemented in 16 months from November 2010 to February 2012.

Two workshops were held in two provinces: (i) on 17th, February 2012 in Nghe An province and (ii) on 21st, February, 2012 in Tuyen Quang province. 192 participants including Dr. Avelina Lopez - Project Technical Director, Ms. Yesmina Macarell - Project Coordinator and Dr. Le Thanh Luu – Project Director, RIA1-AIDA project staff members, representatives of Nghe An and Tuyen Quang’s Department of Agriculture and Rural Development, local authorities and the project beneficiaries had attended the two workshops.

In the workshops, the project manager has reported the project achievements, remarked conclusions and recommendations for cage aquaculture in the following years. Generally, the project has achieved several objectives: beneficiaries have enhanced their knowledge about aquaculture and co-management. Particularly, aquaculture has contributed to a significant increase in beneficiary household’s income. Delegates from two provincial Departments of Agriculture and Rural Development and local authorities was highly impressed about the project socio-economic effectiveness, and committed to support farmers to develop fish cage culture and expand the model in the future. Dr Le Thanh Luu had summarized the advantages and disadvantages of each province to develop cage culture. He finally concluded that fish cage culture is a new job in the project sites that needs the local authorities to pay more attention by issuing suitable policies such as capital and water surface plan to culture fish. Institute of Aquaculture Research No 1 is willing to provide technical advices for the farmers and local officers whenever needed.

* In connection with AIDA’s activities, Directorate board of RIA1 had a meeting with Director of AIDA on 19th March 2012 to discuss in order to launch the action plan for promoting cooperation between AIDA and RIA1 in the future.
The Papua New Guinea Delegation of Agriculture and Livestock Department visited the RIA1

Vu Ngoc Lien

On the 16th March 2012, Papua New Guinea (PNG) delegation of Agriculture and Livestock Department (DAL) visited and worked with RIA1 on the occasion of attending the 31st session of the FAO Regional Conference for Asia and the Pacific in Vietnam from 12 to 16 March 2012. The PNG delegation was welcomed by Dr Phan Thi Van, Leader of RIA1 with other Heads of Department including Dr. Nguyen Van Tien, Head of Applied Biology Department, Dr Bui The Anh, Head of Inland Fisheries and Natural Resources, Dr. Dang Thi Lua, Head of Disease Department (CEDMA), Mr. Ngo Phu Thoa, researcher of Genetics and Selection Department, and Ms. Vu Thi Ngoc Lien, officer of Information - International Collaboration and Education Department. The PNG delegation with 3 members was led by Mr Masayan Moat, the Acting Deputy Secretary of the Department of Agriculture and Livestock.

After the greeting of Ms. Phan Thi Van, Mr. Masayan Moat, on behalf of PNG delegation, sincerely thanked RIA 1 for the warm welcome and do hope that of this visit, they have the overview of Vietnam fisheries and aquaculture and could clearly identify their needs. He also expressed the interest to cooperate with RIA 1 especially under the South – South Cooperation Program of FAO. In order to help the delegation to know more about RIA 1, Dr. Phan Thi Van briefly introduced RIA 1’s structure, human resources, the major research areas as well as the achievements in recent years. She also gave the expression to collaborate with DAL in the fisheries and aquaculture fields such as sharing knowledge and experience, and technology transfer, etc. The delegation really interested in some cultured species at RIA 1, especially grouper, rainbow trout, mollusc, etc.

Dal visiting laboratory of RIA1. Photo Vu Ngoc Lien

Both DAL and RIA1 do hope that the visit will be a premise for opening a fruitful cooperation relationship between the two partners in the coming future.

Welcome the Japanese delegation to RIA1

Hoang Thuy

On 21st March 2012, Japanese delegations visited and worked with RIA1. At the meeting, Vice Director Dr. Nguyen Huu Ninh presented a summary view of the RIA1’s current status and future strategies. In which, the field of cold-water aquaculture in RIA1 was the subject to discuss during the meeting. After that, Japanese delegations visited the aquafeed research and production area and Centre for Cold-water Aquaculture Research Sapa in Lao Cai.
RIA1’s activity abroad

Development of lobster aquaculture in Cuba

Nguyen Quang Huy

Within the Vietnamese government funded project entitled "Support for development of aquaculture in Cuba during 2009-2011", two marine aquaculture specialists, Dr. Nguyen Quang Huy from RIA1 and Ms Nguyen Thi Hong Tuyen from RIA3 were sent to Cuba from March 7th 2012 for implementation of the project’s activities in development of Cuban lobster (*Panulirus argus*) aquaculture. The tasks of the experts are to advise and train Cuban personnel on i) Production, assembling and operation of sea farming cages, ii) Methods of lobster seed (pueruli) collection, trials of seed collection by various types of collectors, iii) Nursery and grow-out techniques of lobster. The activities of the lobster components are carried out in Carahatas province, 340 km south of Capital Havana. During the first two weeks, the experts have i) introduced to leaders, technicians and fish men of Cairabien fisheries and processing company on overview of sea cage farming systems, lobster cages and lobster aquaculture in Vietnam, ii) trained technical staff and fishers on how to produce, assemble and operate wooden cages and iii) completed installation of a wooden cage system delivered from Vietnam. Brackish and marine aquaculture is still very new to Cuba. The only existing activity is farming of white leg shrimp in small scale. The installed cage system is the first one in Cuba. The followed up activities of the lobster component will be implemented with the participation of scientists from the Fisheries Research Center of Cuba (CIP).