AQUACULTURE DEVELOPMENT IN INDONESIA

Ketut Sugama
Center for Research and Development of Aquaculture
Agency for Research and Development of Marine and Fisheries
Ministry of Marine Affairs and Fisheries of Indonesia

Abstract

Indonesia has a long history of aquaculture since 15th century. Subsequently, the country has become a significant contributor to global aquaculture production, destined for both International and domestic markets. In 2004, the Government of Indonesia announced its vision to increase aquaculture production almost two times from 14.54 million MT in 2014 to 30.50 million MT in 2019. To meet the vision of a dramatic expansion of aquaculture production one or more of following strategy is required: intensification and production segmentation, areal expansion and/or production diversification. Most likely the continued development of aquaculture production in Indonesia will be a combination on these three strategies, with the relative influence of depending on production sector and market demands. Nowadays, aquaculture is important contributors to the Indonesian economy providing foods security through primary production, income generation in rural areas, and generating significant export earnings. Today, aquaculture development has been accelerated and considered as an important sector for supporting rural economic development. While Indonesia capture fisheries are regarded a being fully exploited, aquaculture is growing rapidly and is viewed as having considerable potential for expansion. From 2010 to 2014 aquaculture production grew at 56.8 %. Indonesia is an archipelagic country with length of coastline about 95.000 km and has a vast potential for aquaculture or mariculture.

SPICE final conference
January 20 & 21, 2016

Proposal	
Affiliated to topic (Session 1- 8)	Aquaculture
Name	Saluz Hans Peter
Institution	Leibniz Institute for Natural Product Research and Infection Biology –HKI, Jena
E-mail	Hanspeter.Saluz@hki-jena.de

Rapid diagnostics and monitoring of shrimp diseases and shrimp pathogens in natural and culture environment and facilities

Saluz H.P.[1,2] Sugama K.[3] Haryanti H.[4]

[1] Cell and Molecular Biology
Leibniz-Institute for Natural
Product Research and Infection Biology
Beutenbergstrasse 11°
07745 Jena
Germany

[2]corresponding author: hanspeter.saluz@hki-jena.de

[3]Center for Research and Development of Aquaculture
Agency for Marine Research and Development MMAF
Jl.Ragunan No 20 12540, Jakarta INDONESIA

[4]Institute for Mariculture Research and Development - IMRAD,
Ds Penyabangan, Br. Gondol PO. Box 140, Singaraja 81101, Bali, Indonesia

Abstract
Within the framework of this project we developed a novel, highly efficient and sensitive, low-cost rapid DNA amplification technology to diagnose and monitor shrimp diseases and shrimp pathogens in host and in natural and culture environment and facilities. The diagnostics involved all major shrimp pathogens. In addition, we searched for molecular marker molecules for the selection of disease resistant shrimp. What is more, for diagnosis no highly specialized persons are needed and the technology can directly be used at the place of shrimp farming. A great advantage of this project concerned a unique Rapid PCR technology invented, developed and patented in our laboratory. By this unique means we were able to develop highly efficient assays, which are still in use to solve shrimp farming-related problems.

MOLECULAR AND MORPHOLOGY IDENTIFICATION OF UNKNOWN SHRIMP SPECIES FROM ACEH INDONESIA

Haryanti[1], Ketut Sugama[2]and Hanspeter Saluz [3]

[1]Institure for Mariculture Research and Developmet –Gondol
[2]Center of Research and Developmet of Fisheries
[3]Hans Knol Institute Jena Germany

Abstract :

Shrimp species identification is traditionally based on external morphological features. Yet, in many cases shrimp and especially their diverse developmental stages are difficult to identify by morphological characters. DNA-based identification methods offer an analytically powerful addition or even an alternative. This work intends to use DNA barcoding for identification of shrimps as belonging to a particular species. Four species of shrimps collected from coastal water of Indonesia these are *Penaeus semisulcatus, Penaeus marguensis, Penaeus monodon* and unkown shrimp *(Penaeus sp),* and one shrimp sample which is introduced species from Hawaii was collected from Gondol Institute of Mariculture Research and Development (IMRAD) hatchery. In order to identify shrimp species, DNA fingerprint with two primers AAM-2 and AS-15, followed by DNA analyses using DNA chip Agilent 2100 Bioanalyzer were applied. Results revealed that morphological characters of those species were differing to one and other although *P monodon* slightly similar to unknown shrimp. Based on DNA fingerprinted data the unknown shrimp from Aceh is different genetically from other four shrimp. DNA barcoding data after blushing shows that identity of *P monodon* and unknown Shrimp only 92 %, suggested that unknown shrimp from Aceh may possible a new species and not identified yet.

Key world: Shrimp, DNA barcoding, new species of shrimp

SPICE final conference

Proposal	
Affiliated to topic (Session 1- 8)	Aquaculture
Name	Prof. Harry W. Palm
Institution	University of Rostock
E-mail	harry.palm@uni-rostock.de

Fish parasites: Aquaculture and food safety/security

Palm, H.W.[1], Damriyasa, I.M.[2], Wiryawan, B.[3], Theisen, S.[1], Neubert, K.[1], Yulianto, I.[3] and Kleinertz, S.[1]

[1] University of Rostock, Aquaculture and Sea-Ranching, Justus-von-Liebig-Weg 6, 18059 Rostock, Germany

[2] Udayana University, Bukit Jimbaran, 80363-Badung, Bali, Indonesia

[3] Bogor Agricultural University, Faculty of Fisheries and Marine Science, Kampus IPB Darmaga, Bogor, Indonesia

corresponding author: harry.palm@uni-rostock.de

Abstract

Due to the use of fish as a major protein resource as well as the importance as export commodity, mariculture gains more and more importance in Indonesia. This necessitates a comprehensive understanding of the exploitable fish resources and the function of fish as parasite transmitters of zoonotic parasites into the consumer, possibly causing human diseases. This presentation comprises the results of the three SPICE phases related with mariculture, food safety and biological indication of fish parasites. During our parasitological screening, no zoonotic nematode, as known from the norther hemisphere (*Anisakis simplex* (s.s.)), was found in more than 1700 analyzed fish from the wild as well as mariculture. Consequently, the possible threat of Anisakiasis caused by Indonesian commercial fish is low. The use of fish parasites as biological indicators enables a closer look to the ecosystem health status within and surrounding Indonesian mariculture facilities. Therefore, a star graph system was developed, enabling visualization of parasitological descriptors. This system allows assessments of environmental conditions and changes, suggesting a use in regular monitoring programs of mariculture facilities. This approach can provide a major contribution to the protection of Indonesian coastal and marine habitats. It can be used by the different stakeholders such as managers and politicians even without high-level biological expertise, supporting decision making in order to further mariculture activities in the coastal regions as well as to support a sustainable use of the marine resources. Taxonomical training of Indonesian students and junior scientists on marine fish parasite in Indonesia was conducted during the first “Educational Workshop on Marine Fish Parasites in Indonesia”. It is strongly recommended to invest into more taxonomic expertise on marine fish parasites, and to better educate mariculture managers and decision makers in future.

SPICE final conference
January 20 & 21, 2016

Proposal	
Affiliated to topic (Session 1- 8)	Aquaculture
Name	Roberto Mayerle
Institution	Research and Technology Centre Westcoast, University of Kiel
E-mail	rmayerle@corelab.uni-kiel.de

Information System for the Management of Coastal Cage Aquaculture in Indonesia

Mayerle, R.[1], Sugama, K.[2], Radiarta, N.[2], Runte, K-H.[1] and Vallejo. S. M.[1]

[1]Research and Technology Centre, University of Kiel
Otto Hahn Platz 3, 24098 Kiel, Germany

[2]Centre for Aquaculture Research & Development, Ministry of Marine Affairs & Fisheries, Indonesia.
corresponding author: rmayerle@corelab.uni-kiel.de

Abstract This paper presents results of the application of the ecosystem approach to aquaculture to an existing small-scale coastal finfish cage facilities in Indonesia. The investigations were carried out in the framework of the research project "Decision Support System for the Management of Cage Fish Farming in Indonesia- SYSMAR" funded by the German and Indonesian governments from 2007 to 2011. The project is coordinated jointly by the Research and Technology Centre Westcoast in Germany and the Coastal Aquaculture Research and Development in Indonesia. Details of the processes and steps adopted according to zoning, site selection and carrying capacity leading to the designation of aquaculture management areas are provided. Emphasis was given to the development and application of systematic procedures of wider applicability based on hydrodynamic model predictions for site selection and carrying capacity. To facilitate decision-making procedures have been embedded into an information system for management of cage aquaculture. A management plan with aquaculture management areas to minimize environmental risks and ensure biosecurity is proposed to the site in Bali. Recommendations are made for proper siting of farms and, for the limits of fish production of each farms, management areas and entire water body. The proposed procedures proved to be quite effective and are well suited to the estimation of the potential of cage aquaculture at the feasibility stage of projects in remote areas in South-East Asia. Assessments are enabled for existing aquaculture facilities and, for new fish farm developments in pristine regions.

SPICE final conference
January 20 & 21, 2016

Proposal	
Affiliated to topic (Session 1- 8)	Aquaculture
Name	Katharina Róisín Niederndorfer
Institution	Research and Technology Centre Westcoast, University of Kiel
E-mail	rmayerle@corelab.uni-kiel.de

Hydrodynamic method for estimating the ecological carrying capacity of fish farms

Niederndorfer, K. R.[1], Mayerle, R.[1] and Narayanan, R.[1]
[1]Research and Technology Centre Westcoast, University of Kiel
Otto Hahn Platz 3
24098 Kiel, Germany
corresponding author: rmayerle@corelab.uni-kiel.de

Abstract

The maximum ecological carrying capacity of fish farms in Pegametan Bay, Indonesia, is studied using a three-dimensional hydrodynamic model coupled to a dispersion model for particulates based on Delft3D. The investigations were carried out in the framework of the research project “Decision Support System for the Management of Cage Fish Farming in Indonesia- SYSMAR” funded by the German and Indonesian governments from 2007 to 2011.The bay is tide-dominated. The particulates, representing the particulate organic carbon wasted from the farm, are discharged from fishfarms with floating net cages. The numerical model determines deposition of particulate carbon on the bed neglecting re-suspension into the flow. The numerical results pertaining to a number of locations in Pegametan Bay, are obtained for various bed roughness coefficients and fall velocities of the particulates. The numerical results are brought together by means of dimensional analysis. It is shown that the ratio of rate of deposition to the rate of discharge of particulate carbon is a function of average Reynolds number of the flow and non-dimensional settling velocity of particulates. The maximum allowable carbon deposition on the bed is specified so that benthic deterioration due to excessive loading of organic matter does not take place. The maximum emission rates are then computed and they are related to maximum standing stock. The results, presented in non-dimensional form, have wider applicability and should be helpful in making decisions for mariculture development projects at the feasibility stage and in areas where environmental field data are rare.

SPICE final conference
January 20 & 21, 2016

Proposal	
Affiliated to topic (Session 1- 8)	Aquaculture
Name	Karl-Heinz Runte
Institution	Research and Technology Centre Westcoast, University of Kiel
E-mail	runte@corelab.uni-kiel.de

Monitoring environmental effects of small-scale cage aquaculture facilities in Bali, Indonesia

Runte, K-H.[1], Mayerle, R. [1] and Sugama, K. [2]

[1]Research and Technology Centre, University of Kiel
Otto Hahn Platz 3, 24098 Kiel, Germany
[2]Centre for Aquaculture Research & Development, Ministry of Marine Affairs & Fisheries, Indonesia.
corresponding author: runte@corelab.uni-kiel.de

Abstract: In this paper results of an assessment of sediment quality underneath fish farms and water quality besides the farms throughout the entire Pegametan Bay in the North of Bali, Indonesia are summarized. The site is the largest cage aquaculture producer in Bali and belongs to the experimental sites of RDIM for conducting research in the field of marine aquaculture. There are currently 30 finfish farms in operation covering and area of 4 ha with a total standing stock of about 345 tons. The investigations were done primarily to assess the environmental impacts due to fish farming and to gather data for validation of model predictions carried out by Niederdorfer et al. (2015) and Mayerle et al. (2015). Assessment of sediment quality was done at farms in which according to the predictions the current standing stock exceeds ecological carrying capacity. Emphasis was given to the analysis of physical and chemical changes in sediments using particle size analysis, content of organic carbon and nitrogen, RedOx potential, pH and sulphide concentration. Particulate wastes tend to settle to the sediments creating a "footprint" of effect underneath fish farms. Video recordings were used to assess sea floor impacts. The results obtained widely confirmed model predictions. Depth profiles of DO were measured in the vicinity of several farms. At most of the farms depth profiles of DO were unremarkable widely reflecting natural conditions. Clear DO decreases to the sea floor were observed close to farms in which production was too high.