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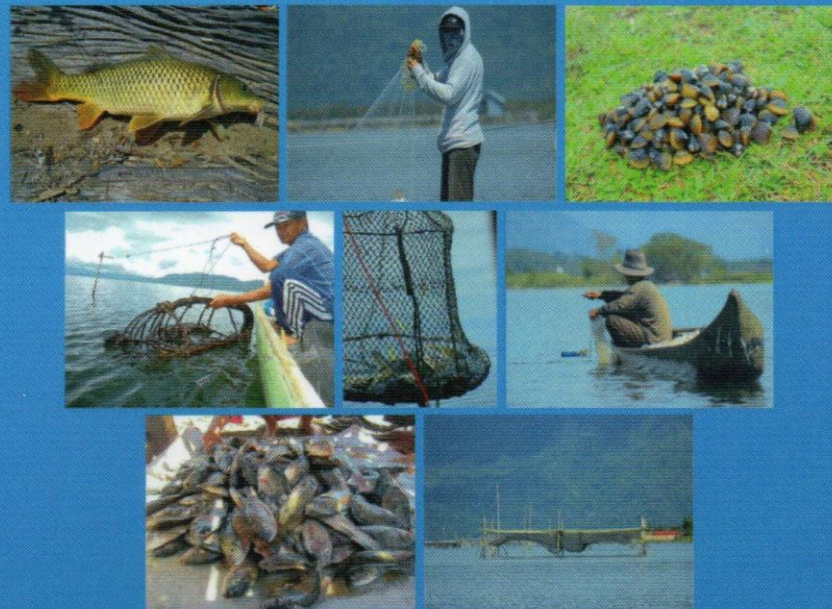
PROCEEDING

International Conference on Inland Fisheries

Palembang
September 2 - 4, 2014

Theme :

**Contribute and Sustainable Use of
Indonesian Aquatic Biodiversity
to Contribute to Food Security**



**Research Institute for Inland Fisheries
Research Center for Fisheries Management and Conservation
Agency for Marine and Fisheries Research and Development**



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INTERNATIONAL CONFERENCE ON INLAND FISHERIES 2014

PROCEEDING

2nd – 4th September 2014, Palembang

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PROCEEDING INTERNATIONAL CONFERENCE ON INLAND FISHERIES

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Research Center for Fisheries Management and Conservation
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PREFACE

Research Institute for Inland Fisheries (RIIF) of Research Center for Fisheries Management and Fish Resources Conservation (RCFMFRC) belong to Agency For Marine and Fisheries Research & Development under the Ministry of Marine Affairs and Fisheries of Republic Indonesia (MMAF-RI), has seriously considered the importance of inland waters for the people. Since 2004, The Research Institute for Inland Fisheries (RIIF) of Research Center for Fisheries Management and Fish Resources Conservation (RCFMFRC) has annually convened Indonesian Forum on Inland Waters in Palembang, South Sumatera. This year is the fourth International Conference on Inland Fisheries. The theme of the Conference is "*Conservation and Sustainable Use of Indonesian Inland Aquatic Biodiversity to Contribute to Food Security*". This conference is aimed at discussing the strategic contribution of related science for proper sustainable management of inland fisheries to contribute to food security.

This proceeding records the fully refereed papers presented at the conference. The conference topics:

- Ecosystem Approach Fisheries Management Initiative for Inland fisheries
- Inland biodiversity conservation management
- Integrated inland waters management: governance, structure and mechanism
- Economic and social benefits on inland waters
- Peat land management practices: rewetting, aquaculture and fisheries
- Inland fisheries and food security.

In this conference, there is about 50 of supporting papers submitted by the authors. All papers reviewed by the editors and 34 of supporting papers selected and published as a special publication in Proceeding of International Conference on Inland Fisheries. The selection of papers based on the content and quality of the papers.

We are grateful to all those who have contributed to the success of ICIF 2014. We hope that all participants and other interested readers benefit scientifically from proceedings and also find it stimulating in the process.

With our warmest regards,

The Organizing Committees
December, 2014
Palembang, Indonesia

ORGANIZING COMMITTEE'S REPORT

The honorable:

Dr. Sharief C. Sutarjo, Minister of Marine Affairs and Fisheries

Mr. Alex Noerdin, Governor of South Sumatera

Dr. Churnman Pongsri, Secretary General of SEAFDEC,

Prof. Dr. Sjarief Widjaja, Secretary General of MMAF,

Distinguished Guests,
Ladies and Gentlemen,

Assalamu'alaikum warohmatullahi wabarokatuh

Om Swastyastu

Good Morning

First of all, let me state our welcome, and thank you to all of you to attend this International Conference on Inland Capture Fisheries with the theme **Conservation and Sustainable Use of Indonesian Inland Aquatic Biodiversity to Contribute to Food Security**. This international conference is arranged in three days seminar and Musi Tour for sight-seeing Musi River.

This conference is organized by Research Institute for Inland Fisheries, supported by Government of South Sumatera Province, FAO, SEAFDEC, various Research Institute, and Universities. Our recent data show that 250 participants attend this conference from overseas (USA, FAO Roma, Mekong River Commission and all countries member of SEAFDEC) as well as from Indonesia. Once again we really appreciate your present.

Within three days activities, conference will present 6 keynote speakers, and 50 papers as research outcome and review will be presented by researcher and lecturer from various institution, and also from others profession related inland fisheries. At the end, it will be formulated into one comprehensive paper of policy recommendation for sustainable management of inland fisheries to contribute to food security.

Our distinguished guest,

Today, we are signing of National legitimacy Documents of SEAFDEC-IFRDMD. For the information that there are 4 departments under SEAFDEC, i.e. in Malaysia (Marine Fisheries Resources Development and Management Department), Singapore (Processing Department), Thailand (Training Department) and Philippines (Aquaculture Department).

Hopefully by developing Inland Fisheries Resources Development and Management Department (IFRDMD) of SEAFDEC will increase our commitment to support research and development of inland waters fisheries within ASEAN countries. Through research activity could prepare suitable management scheme and finally, the management manner can be applied to support ecological and economical sounds of resources utilization.

Ladies and gentlemen,

To all our partner, I truly appreciate for strong support. We hope this conference will be running based on what we have planned.

I kindly invite Governor of South Sumatera for welcoming remarks, Secretary General of SEAFDEC and for Minister of Marine Affairs and Fisheries to give opening remark of the conference and inauguration of SEAFDEC-IFRDMD.

Thank you.

Wassalamu'alaikum warohmatullahi wabarokatuh.

Chairman of Marine Affairs and Fisheries Research Agency

Dr. Achmad Poernomo

REMARKS

THE MINISTER OF MARINE AFFAIRS AND FISHERIES

Addressed by Secretary General of Minister of Marine Affairs and fisheries

Assalamualaikum wr. wb., good morning and best wishes to all of us,

1. Excellencies Ambassadors and Representatives of SEAFDEC Member Countries,
2. Excellency Dr. Chumnarn Pongsri, Secretary General of SEAFDEC,
3. Honorable Mr. Alex Nurdin, The Governor of South Sumatera Province,
4. Echelons 1 of the Ministry of Marine Affairs and Fisheries, Deputies and other Government Officials,
5. Distinguished Speakers and Participants from FAO, South East Asian Countries, and Japan,
6. Distinguished Delegates and Guests, Ladies and Gentlemen,

First of all, let us praise the Lord, the Almighty who has granted us the opportunity to be here today to attend the **Opening Ceremony of this important International Conference on Inland Capture Fisheries and Inauguration of SEAFDEC Inland Fishery Resources Development and Management Department (IFRDMD)**.

I would also like to express my appreciation to all participants for attending these Events, especially to those who have made long journey to be here in Palembang, South Sumatera. I wish you all a very warm welcome to Palembang.

Distinguished guests, Ladies and Gentlemen,

Indonesian inland waters cover around 54 million Ha, of which 12 millions Ha consists of rivers and floodplains, 39 millions Ha of swamps and 2 millions Ha of lakes and other water bodies. They sustain the life of some parts of mega-biodiversity of Indonesia and it constitutes of at least 1,200 species of fishes (210 species kept as wet specimen in fish collection of Research Institute for Inland Fisheries Palembang), 200 species of shrimp and crabs, 315 species of mollusk, 200 species of amphibian, 100 species of reptiles and others. Due to this context, the scientific based management of Indonesian inland waters will be also very important to be addressed internationally.

Inland waters in Indonesia have played significant role in providing fisheries resources, either for capture fisheries activities or aquaculture or even for biodiversity both to support food security or ornamental fish busnises. Yearly, up to 1 million tons of fish can be potentially harvested from our inland waters; however current estimates show that this has only been utilized at the level of 50%. Inland waters have also become the source of living for more than 1 million people from the surrounding communities. This again reflects their important role in achieving the goal of fisheries development which is shared by three approaches, which are: pro poor, pro job and pro growth.

Inland water has been utilized by many sectors and stakeholders, where fisheries as one main sector. Their functions include as source of fresh water, biodiversity, food security and source of income for people. However, activities that have been done in utilizing inland waters resources could adversely affect the ecosystem itself such as pollution, sedimentation, extinction of several endemic biotas and changing structure of the water body.

Currently, it is estimated that ten big lakes in Indonesia are in such deteriorated state, that they have lost their capacity in supporting the economy of the surroundings. Serious efforts are now being taken to rehabilitate the lakes, and this is indeed a costly lesson and should not happen again in the future.

Ladies and Gentlemen,

As inland waters are also complex in nature, where its management should take into account not only for the fisheries resources, but also other available resources, through integrated involvement of all stakeholders. Therefore I am delighted to learn that experts, scientist, policy makers and other stakeholders to present in this three days conference for sharing information and knowledge on the management of inland waters. I believe that this is a good move to bridge the gap and build the communication among us, and at the end it is expected that a sound management measures can be formulated.

Honorable and Distinguished guests, Ladies and Gentlemen,

Recognizing the importance of inland fisheries, particularly to support food security and livelihood in the ASEAN region, Indonesia has proposed to establish a Regional Center for Inland Fisheries Development as part of SEAFDEC organization, namely Inland Fishery Resources Development and Management Department (IFRDMD). The proposal was supported by the ASEAN-SEAFDEC Member Countries during the 14th Meeting of the Fisheries Consultative Group of the ASEAN-SEAFDEC Strategic Partnership (FCG/ASSP) in November 2011, and the SEAFDEC Council Meeting during its 44th Meeting in April 2012.

The SEAFDEC - IFRDMD will act as a center that aims to assist SEAFDEC Member Countries in matters leading to the sustainable development and management of the inland fisheries resources in the region, by providing among others: a regional forum for consultation and cooperation in research and management of inland fisheries resources; scientific basis and appropriate guidelines; advice on management of inland fisheries resources, and; publication, dissemination and exchange information.

I am very happy that today we can witness the noteworthy moment of the process IFRDMD Inauguration by the Signing Document of Privileges Accorded to IFRDMD by Secretary General of Ministry of Marine Affairs and Fisheries of the Republic of Indonesia and its presentation to SEAFDEC Secretary General. I do hope with the establishment of IFRDMD, the regional needs and problems SEAFDEC Member Countries, associated with the responsibility to conserve and manage the inland fisheries for sustained development, and could be addressed more effectively.

Honorable and Distinguished guests, Ladies and Gentlemen,

I strongly believe that this conference will produce fruitful results where the presence of international and local experts will add to the weight of this conference.

Finally before concluding my remarks, I would like to take this opportunity to express my appreciation to Local Government, especially to the Governor of South Sumatera for the valuable support, especially the contribution for donating the land area of 1.6 hectares for IFRDMD building. I believe that our Research Institute here in Palembang will be a good partner in managing the inland waters in South Sumatera as well as other parts of Indonesia.

With the blessing of the Almighty God, **I declare that the International Conference on Inland Capture Fisheries is officially opened and the SEAFDEC – IFRDMD is institutionally inaugurated.** I hope all of you may enjoy your meeting and sightseeing in this beautiful Palembang City.

Thank you.

Wabillahi taufik wal hidayah, Wassalamu'alaikum Wr. Wb.

Palembang, September 2, 2014

On Behalf of the Minister of Marine Affairs and Fisheries,
Secretary General,

Prof. Ir. Sjarief Widjaya, Ph.D.,FRINA

WELCOMING REMARKS GOVERNOR OF SOUTH SUMATRA PROVINCE

Palembang, 2 September 2014

Bismillahirrohmanirrohim
Assalamu'alaikum warohmatullahi wabarokatuh

The Honorable,

- Minister for Marine Affairs and Fisheries Republic of Indonesia, Sharif C. Sutarjo
- Secretary General of SEAFDEC, Dr. Chumnarn Pongsri
- Director General for Marine and Fisheries Research and Development, Dr. Achmad Poernomo;
- The First Ecelon Officials of Ministry of Marine Affairs and Fisheries Republic of Indonesia;
- Distinguished Speakers, Participants from FAO and ASEAN Member Countries and Japan, and all over Indonesia

Praise to the Almighty God for the blessing us with grace and health to be here today in this momentous occasion.

On behalf of the Government of South Sumatera I would like to espessially welcome His Excellency Minister for Marine Affairs and Fisheries Republic of Indonesia in Srivijaya Land.

Ladies and Gentlemen,

South Sumatra Province with its strategic location has over 7 Millions population, abundant mineral resources as well as vast energy and food resources, placing this province as 5th richest province in Indonesia.

These precious natural resources should be utilize in wise and sustainable manner in order to bring about people's welfare to the most as well as to drive advancement of the community itself.

Therefore the Government of South Sumatera is currently undertaking a mission to realize this visionary objective that is Prosperous, Advanced and Internationally Competitive South Sumatera.

Ladies and Gentlemen,

Speaking of Inland Waters, South Sumatera has an estimated 2,5 Million Ha of Inland Water bodies, consisting of Musi River and its subsidiaries, swams, lakes and other water bodies.

Inland waters function significantly as fresh water resources, habitats for various kind of plants and animals, and is important to support communities economy such as farming, aquacultures, as well as agriculture. Fisheries potential in 2013 alone yeilded 525,679,3 tonnes with the following details; 51.952 tonnes of inland capture fisheries, 44.531,8 tonnes of marine capture fisheries, and 429.195,5 tonnes of Aquaculture fisheries. In terms of biodiversity, The Musi River has over 221 fish species.

Excellencies, Ladies and Gentlemen,

In this opportunity I am delighted to welcome the establishment of the fifth Department of SEAFDEC, the Inland Fisheries Resources Development and Management Department, to joint the already existing four departments in Thailand, Singapore, Philipine and Malaysia. It is our honor that Palembang has been chosen as the seat of this department. I trully hope that the fishery potentials in South Sumatra and Indonesia and in ASEAN in general can be further developed

which may eventually contribute largely to the science and better management of Indonesian, ASEAN and the world Inland water bodies.

Ladies and Gentlemen,

Finally I would like to say have a nice and productive seminar, enjoy the breathtaking beauty and hospitality that South Sumatera can offer and off course, dont go home without taking a bite to some of our cullinary specialties. May God be with us all the way through the conclusion of the occasion.

Thank you.

Billahitaufik walhidayah

Wassalamu'alaikum warohmatullahi wabarokatuh

Governeur of Sumatera Selatan,

Ir. Alex Noerdin

SYNTHESIS AND FORMULATION STATEMENT THE INTERNATIONAL CONFERENCE ON INLAND FISHERIES

Palembang, September 2-4, 2014

1. The Agency for Marine Affairs and Fisheries Research and Development through Research Institute for Inland Fisheries has already conducted International Conferences on Inland Capture Fisheries 4 times since 2008. Together with the conferences at national level, there had been 11 conferences on Inland Capture Fisheries since 2004. A couple of recommendations had already been launched through these important conferences. It is expected that the conference could be continued regularly in the coming years.
2. FAO indicated that Inland fisheries are vitally important to South East Asia and to the world in general. In 2012, a record of 11.6 million tons was reported by FAO as harvested from the world's inland fisheries. Asia accounts for 2/3 of all inland capture fishery production. Of the top 15 producing countries, eight are in Asia and five of these are in South East Asia. SEAFDEC Member States contribute more than 2.6 million tons to global production. However, this is thought to be a vast underestimation of the real production from inland capture fisheries in those SEAFDEC countries members.
3. SEAFDEC noted that in 2012, the total production of South-east Asian countries inland fisheries were 2.8 million MT. Myanmar contributed 44 percent of the total production, Cambodia 19 percent, Indonesia 14 percent, Thailand 8 percent, Vietnam and the Philippines 7 percent respectively, while the rest were shared by Lao PDR and Malaysia. The data showed that inland fisheries activities are among the important source of income and protein supply for most of the ASEAN countries.
4. Major characteristics of ASEAN inland fisheries are: involving large number of small-scale fishers (including part-time and subsistent fishers), highly seasonal, highly diversified production (small in size, but large in number, with high species diversity), no designated fishing port, and targeted for household consumption, sold in local/domestic markets, or exported to intra-regional markets. The challenge is then to convert this restriction into opportunity to develop inland fisheries in the near future.
5. The current South East Asia Inland Fisheries issues. In general within each of the South East Asian Country there are challenges and opportunity such as: (i) low Priority by planners & decision on Inland water Fisheries; (ii) application of ecosystem approach to balance the development project and ecosystem function; (iii) mitigation measures to secure the ecosystem function; (iv) maximising utilization of inland fisheries resources; (v) fisheries resources enhancement program; and (vi) adaptation of inland fisheries to climate change.
6. In relation to the inland fisheries production, it is raised three important issues: organic deposition of feces and uneaten feed; ammonia production; and other factors such as

genetics, invasive species, and drugs/chemicals. The issues are mainly related to the fact that only 25-30% of feed fed to fish ends up as harvested fish tissue; the rest ends up in the environment. It is therefore important for inland fisheries activities to consider these three concepts to lead to sustainable inland fisheries activities: ***Production Carrying Capacity***-maximum aquaculture production that does not have unacceptable impacts on the farm itself; ***Ecological Carrying Capacity***-maximum aquaculture production that does not cause unacceptable impacts to the ecosystem; and ***Social Carrying Capacity***-maximum aquaculture production that does not cause unacceptable impacts to the social system.

7. Toward sustainable inland aquaculture is connecting to the competition among stakeholders. Inland aquaculture is affected by many other sectors which might give more economic benefits. Initiating ecosystem approach to fisheries management for example will be beneficial on multi stake holders and different administrative levels. Lesson learnt from one country might be useful for the others through the regional cooperation.
8. Related to the coming ASEAN Economic Community 2015, there will be one market of inland fisheries as well as one production base. In addition, there will be stronger competition among users for limited land and water resources. It is then required for ASEAN Countries to be aware of the characteristics of inland capture fisheries to be linked with other related activities, challenges and opportunity for inland fisheries sustainability, developing cooperation for the sustainability, and deciding regional priority on each of the participating countries. ASEAN and SEAFDEC activities may be of help of these regards.
9. Tropical peatland is considered to be potential in supporting inland fisheries and aquaculture activities. With this regards, Tropical-peatland-based aquaculture has to be spatially arranged with landscape of the surrounding areas. Deep rooted plantation using deep drainage canals will be conflicted as of water management concern with aquaculture. Spatial planning is then considered to be the key factor.
10. Tropical peatland has good potential for aquaculture in rivers, lakes, using "***beje***" or normal pool schemes. Fisheries development in peatland will provide another important contribution in reducing carbon emissions due to its process that involve keeping the area wet (rewetting) and as buffers limiting the spread of fire in peat. In addition, naturally contributes to the livelihood and income to communities around peatland areas.
11. "***Beje***" is a traditional fishing method in tropical peat and peat forests, to provide a source of food from traditional fisheries, relying on fluctuations in the movement of water or overflow of river water during the rainy season (November to March) by using a trap in the form of an artificial pond or special tools, allowing fish to breed in the pond and later harvested during the dry season when the water recedes (April to October).
12. As a country with the world's largest reserves in tropical peatlands, "***beje***" must be an important "science asset" in the strategy to reduce carbon emissions, the "target" is not only "***beje***", but returning the area to produce fish. Successful implementation of this proposal will

be a great contribution to science to reduce carbon emissions by rewetting method. The science of rewetting in Indonesia will be a source of inspiration for the region, especially in countries that have peat reserves such as Malaysia, Thailand, Vietnam and Papua New Guinea. It will also become a source of scientific data to be studied by universities and world experts on tropical peat.

13. Due to its closeness to the everyday activities of local communities, inland fisheries are frequently characterized by local wisdoms application. In major provinces in Sumatera Island, for example, Lubuk Larangan (forbidden stream pool) is applied consistently. For a certain agreed period, fishing activities are forbidden in that lubuk/stream pool. This is related to the nature of the stream pool as an ideal place for juvenile fish habitat. Specific efforts are needed to preserve this inland fisheries conservation practices.
14. There is a strong indication that women are involved not only in post-harvest activities but are also active in harvesting fish in inland fisheries activities. Women are active in small-scale processing and marketing of fish. Both women and men consider fishing as men's work but women are almost equally involved in fishing activities. Gender division of labor should be seen as dynamic rather than static issues. It is therefore important that women's activities are fully supported so they will be able to continue to contribute in providing inexpensive but high quality protein to the country's poor.
15. Satellite radar facility developed by INDESO Project would be available in the near future. This technology would support in evaluating the actual total area of inland waters potential for capture fisheries and indentifying the potential location of favorable areas for developing freshwater aquaculture to support the industry and readapt the pond management plans.
16. Upwelling research initiatives has been proposed for joint regional cooperation research for 2015-2019. The project would be focused on physical and bio-geo-chemistry process through observation and numerical model, and its impact on human dimension aspects. Inland fisheries research and management, particularly on eels as high-value fish, will be potentially and expected to be involved in human dimension aspects as a linkages between inland and ocean fisheries. It is expected that this could be a milestone toward comprehensive sea-inland management and conservation of eel.
17. Inland waters biodiversity is continuously threatened by overfishing, water pollution, habitat destruction, flow modification, and invasive species. As it is now being global challenge, it is important to include climate change studies along the attempt to minimize, to manage, and adapt those problems. This is likely since the deterioration of both habitat and its natural resources in inland waters are combination effect of both natural and anthropogenic impact.
18. Challenges and opportunity faced by South-east Asian countries are: low priority on inland waters fisheries development among planners; application of ecosystem approach to balance the development project and ecosystem function; mitigation measures to secure the

ecosystem function; optimising utilization of inland fisheries resources; fisheries resources enhancement program; and adaptation of inland fisheries to climate change.

19. Applying Ecosystem Approach to Fisheries Management (EAFM) for inland water fisheries is highly recommended. EAFM is an ecosystem approach to fisheries strives to balance diverse societal objectives, by taking into account the knowledge and uncertainties about biotic, a-biotic and human components of ecosystems and their interactions and applying an integrated approach to fisheries within ecologically meaningful boundaries. The application is then expected to be very valuable in developing inland fisheries without endangering the environment.
20. Important agendas on inland fisheries development on the near future are: improving inland fisheries data including actual inland waters areas and fish catch data; developing data management system internally and among related countries, developing best practices on inland fisheries that underlining conservation and sustainability aspects, identifying and strengthening local wisdom application on inland fisheries activities, developing and supporting the role of women in inland fisheries activities, and developing further awareness on inland fisheries existence at international level.

Formulators Team

Andin Taryoto, Bambang Setiadi, Robiyanto H Susanto, Ngurah N Wiadnyana, A Karim Gaffar, Mukhlis Kamal, and Arif Wibowo

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COMPOSITION AND COMMUNITY STRUCTURE OF ZOOPLANKTON IN BANGKA STRAIT WATERS

Isnaini, Riris Aryawati & Heron Surbakti¹

ABSTRACT

As the initial producer, phytoplankton serve or feeding zooplankton. So that the position of zooplankton commonly referred as first consumer or second producer, a food source for small pelagic fishes and other biotas. The aims of the study to determine the composition, abundance and community structure of zooplankton in the Bangka Straits waters. The research was conducted in August 2011 in the Bangka Strait. Point determination by purposive sampling stations consisting of 34 stations. Composition of zooplankton in Bangka Strait are 24 species of nine classes, Acantharia, Aciculata, Actinopterygii Foraminifera, Gastropoda, Leptolida, Malacostraca, Maxillopoda, and Oligotrichea. Zooplankton abundance variate with location group from 10 to 95ind/l. Diversity index ranged between 1,00-3.88, similarity index ranged between 0.85-1.00 and for the dominance index values obtaine dranged from 0.07 to 0.50.

Keywords: *Composition, Community structure, Zooplankton, Bangka Strait*

INTRODUCTION

Bangka Strait waters are waters that are used for a variety of community activities, one of which is the activity of catching fish. This community activity is based on the high potential of marine resources in Bangka Strait waters. Based on the catch contained in this area in 2005 to reach 19,652.40 tons (DKP Bangka Belitung 2005).

The amount of catches are strongly influenced by the condition of primary productivity in the waters. Primary productivity of phytoplankton is a condition in which the content of organic substances that can be produced by phytoplankton from inorganic substances through the process of photosynthesis (Parsons et. al. 1984; Nybakken1992).

The fundamental difference between phytoplankton and zooplankton, the phytoplankton plants that are zooplankton while the animal nature. Wibisono (2005), phytoplankton serve as the initial producer is feed for zooplankton, so the

position of zooplankton commonly referred to as the first consumer or producer second, so it is a food source for zooplankton-small pelagic fish and other biota.

The purpose of this study was to determine the composition and abundance of zooplankton and analyze the community structure of zooplankton in the Bangka Strait waters.

MATERIALS AND METHODS

The research was conducted in August 2011 in the Bangka Strait. Determination by purposive sampling station point, at which point the station on research conducted in the Bangka Strait consisting of 34 stations have been locate (Figure 1). Data in the form of water samples taken at each station and observation and identification in the laboratory of Marine Sciences, Faculty of Science and Mathematics, University of Sriwijaya.

¹Marine Science Departement, Sriwijaya University

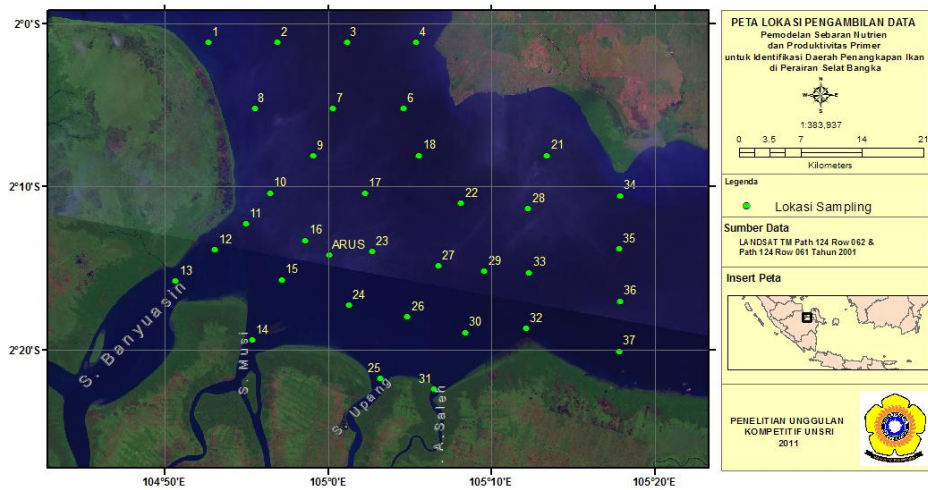


Figure1. Map of Research Station in Bangka Strait waters.

Sampling methods

Zooplankton samples were taken at 34 stations have been located. Samples were taken as much as 100 liters of water and filtered using a plankton net with a mesh size of 20µm and performed 2 repetitions at each station. The next sample was obtained accommodated on plankton collector tube (bottle movie) size 30 ml and preserved with 4% formalin.

Identification, Abundance and Community Structure of Zooplankton

Identification of zooplankton observed under a microscope, and then determined the types of zooplankton with plankton identification book (Davis 1955; Yamaji 1956; Wicstead 1965; Newell&Newell 1977; Thomas 1997). Abundance and community structure analysis zooplankton can be seen in Tabel 1.

Table. 1 Zooplankton Data Analysis

Data Analysis	Formula	Specification
Abundance (APHA, 1992)	$N = \frac{n}{p} \times \frac{ISR}{I_p} \times \frac{V_l}{V_{SRC}} \times \frac{1}{V_T}$	N= the abundance of plankton (cells /l) n= number of plankton tercacah(cell) p= number ofv isual field ISR = the total field of view (1000 mm2) lp= wide field of view (mm2) Vl= volume of water filtered sample (l) Sedgwickrafter VSRC = volume (1 ml) VT= volume of water filtered (l)
Diversity (Shannon & Weaver, 1963 in Parsons et al, 1984)	$H^1 = \sum_{i=1}^n Pi \text{Log}_2 Pi$	H '= diversity index types pi = ni / N ni = total number of individuals to-i N = total number of individuals
Uniformity (Shannon & Weaver, 1963 in Parsons et al, 1984)	$E = \frac{H^1}{H_{maks}}$	E= uniformity index types H'= diversity index Hmax=lnS S=Number of species
Dominance (Shannon & Weaver, 1963 in Parsons et al, 1984)	$D = \sum_{i=1}^n (ni / N)^2$	C= Value of Dominance ni=Number of individuals of speciesi-th N=total number of individuals

RESULTS AND DISCUSSION

Zooplankton Composition

Based on identification of zooplankton from the 34 observation stations in Bangka Strait there are 24 types. In Figure 2 zooplankton composition consists of nine classes, where class Acantharia 1.46%, Aciculata 2.91%, Actinopterygii, 5.82%, Foraminifera 1.46%, Gastropoda 1.82%, Leptolida 0.36%, Malacostraca 22.49%, Maxillopoda 61.14% dan oligotrichea 2.55%. In Table 2 there area variety of zooplankton were found at station15, which consists of 16 genera in seven classes the most dominant zooplankton found in Maxillopoda class, while the lowest level of diversity found in 3 stations, the stations 29, 35 and 37, which consists of 2 genera each station.

Zooplankton abundance

Zooplankton abundance variate with location group from 10 to 95 ind/l (Fig. 3). Figure 3 shows the abundance of zooplankton in Bangka Strait at station 11 had the highest zooplankton abundance (95ind/l). Stations 29, 35 and 37 has the smallest zooplankton abundance (10ind/l). The high abundance of station 11 due to the amount of the genus *Calanus* which dominates at the station, where the abundance of 15ind/l. At the station that has the smallest abundance due to station 29, 35, and 37 have a low value of diversity index at the station, which is 1.00.

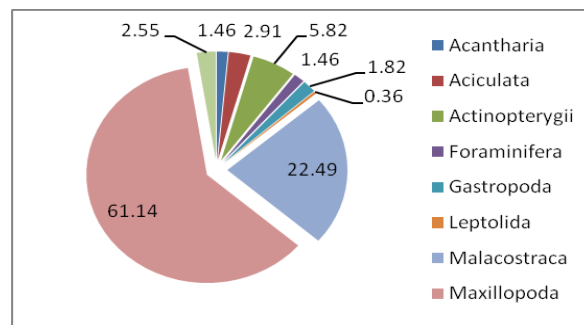


Figure 2. Pie chart of Zooplankton composition in Bangka Strait.

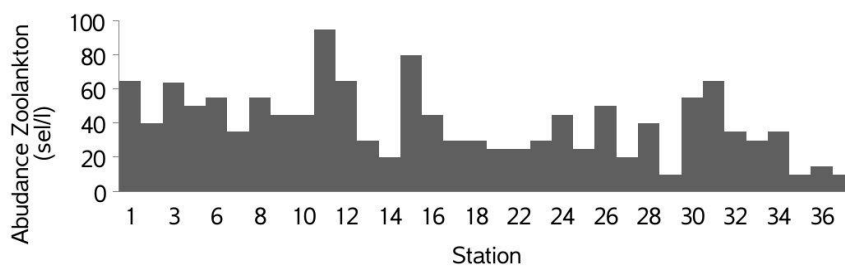


Figure 3. Chart of Zooplankton Abundance in the Bangka Strait.

Community Structure of Zooplankton

zooplankton in Bangka Strait is presented in Figure 4.

The value of diversity index (H'), similarity index and dominance index

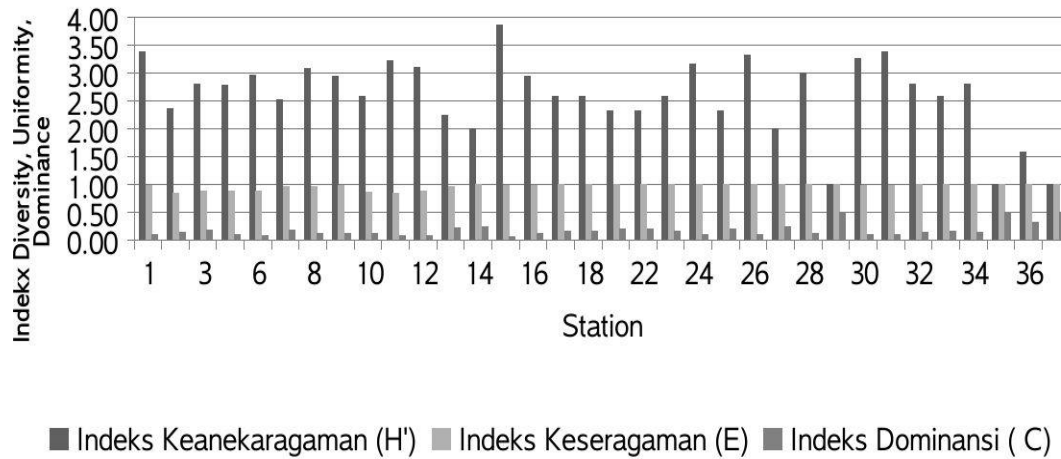


Figure 4. Charts value of Diversity Index (H'), Similarity Index (E) and Dominance Index (C) in the Bangka Straits.

Based on Figure 4, the diversity index value in all observation stations ranged between 1.00 - 3.88. The similarity index value in all observation stations ranged between 0.85 – 1.00 and for the dominance index values obtained ranged from 0.07 to 0.50.

Value is highest diversity index at station 15 (3.88) and the lowest at station 29; 35 and 37(1.00). High value s at station 15 is presumably because it has a low dominance index value (0.07). Instead the low diversity at station 29; 35 and 37 is expected because it has a high dominance index value (0.5).

According to Poole(1974) in Supono (2008) provided that if $E > 0.6$, then the type of high similarity. Based on this, the similarity index value sat stations 14, 17; 18; 21; 22; 23; 24; 25; 26; 27; 28; 29; 32; 33; 34; 35; 36 and 37 have a high similarity index (1.00). This is because at the station there are several types of zooplankton and no species dominate. Arinardi *et.al.* (1997) explain where the higher the index value, meaning the plankton community was more diverse in waters not dominated by one or two tax a only.

Dominance index at station 29; 35 and station 37 has a dominance

index value, which is 0.50 which means there is a dominant species. Basmi (2000) said when the dominance index close to 1, then in community structure was observed encountered types that dominate other species, while other stations have index values ranged from 0.07 to 0.33, which means that if the dominance index values close to 0, then no species dominate.

CONCLUSION

Composition of zooplankton in Bangka Strait are 24 species of nine classes, Acantharia, Aciculata, Actinopterygii Foraminifera, Gastropoda, Leptolida, Malacostraca, Maxillopoda, and Oligotrichea. Zooplankton abundance variate with location group from 10 to 95 ind/l. Diversity index ranged between 1,00-3.88, similarity index ranged between 0.85–1.00 and for the dominance index values obtained ranged from 0.07 to 0.50.

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Appendix 1. Zooplankton are found in Bangka Strait waters

No	Kelas /Genus	Stasiun																																						
		1	2	3	4	6	7	8	9	10	11	12	13	14	15	16	17	18	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37					
Acantharia																																								
1	<i>Acanthochiasma</i>	-	-	-	+	+	-	-	-	-	+	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Aciculata																																								
Larva																																								
2	Polychaeta	+	-	+	-	-	-	-	-	+	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	+	-	+	+	-	-	+	-	-	-	-				
Actinopterygii																																								
3	Larva ikan	-	-	+	+	-	+	+	+	+	+	+	-	+	+	+	+	-	-	-	+	+	-	-	-	-	-	+	-	-	+	-	-	-	-	-	-			
Foraminifera																																								
4	<i>Candeina</i>	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-				
5	<i>Globigerina</i>	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Gastropoda																																								
6	<i>Heteropod</i>	-	-	-	-	-	-	+	+	+	-	-	-	+	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-			
Leptolida																																								
7	<i>Sarsia</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-			
Malacostraca																																								
Euphausiid																																								
8	nauplius	+	+	+	+	+	+	+	+	+	+	+	-	+	+	-	+	+	-	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	+	-	+	+		
9	Mysids	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
10	Paramysid penaeid	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
11	nauplius	-	+	-	+	+	-	-	-	-	+	+	-	+	+	-	+	+	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	+	-	-

Note: + = found; - = not found

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