Proceedings

The 1st Capture Fisheries International Symposium

"Transdisciplinary Approaches Promoting Sustainable Marine Fisheries"

IPB International Convention Center - Bogor, October 18th 2019

Hosted by:
Department of Fisheries Resources Utilization
Faculty of Fisheries and Marine Sciences
IPB University
and
Forum Komunikasi Kemitraan Perikanan Tangkap (FK2PT)

Supported by:
Directorate General of Products Competitiveness
Ministry of Marine Affairs and Fisheries

IPB University
Bogor Indonesia

KEMENTERIAN KELAUTAN DAN PERIKANAN

FK2PT

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Preface

These proceedings provide documentation of the first international symposium held by the Department of Fisheries Resources Utilization – Faculty of Fisheries and Marine Sciences – IPB University in collaboration with the Forum Komunikasi Kemitraan Perikanan Tangkap (FK2PT) (translation: the Partnership Communication Forum of Capture Fisheries). It listed a keynote speaker, five invited speakers, and twenty-one session presenters who are involved in fisheries sciences, technology, and arts. All speakers and presenters delivered a significant contribution in terms of information of their experience and ideas that are important in building sustainable fisheries, not only in Indonesia but throughout southeast Asia. The abstracts of their talks are provided in these proceedings. The proceedings also contain two full papers as requested by their authors.

As advised at the announcement of the symposium, each presenter was given an opportunity to choose their preference in publishing the presentation. We have collaborated with Chief Editors of some respective scientific journals (such as Asian Fisheries Science Journal, Hayati Journal of Biosciences, Jurnal Marine Fisheries, Jurnal Penelitian Perikanan Indonesia, Indonesian Fisheries Research Journal, Jurnal Kebijakan Perikanan Indonesia, Bawal Widya Riset Perikanan Tangkap) that some of the participants of this symposium may submit their full papers to those journals. We appreciate those who eventually made an effort to publish their papers in such journals.

We hope these proceedings will encourage all of you to continue participating in the incoming international seminars on the subject of science, technology, and arts in capture fisheries.

Thank you very much.

Bogor, November 2021

CONTENTS

INTRODUCTION to the SYMPOSIUM

Fishing is one of critical businesses in the world in providing food supplies and livelihood for coastal and small island communities. The global fish production from fishing has been about 90 million tons per year since the 1990s. This economic activity is the most reliable proof of the benefit of fish resources available in the 2/3 global surface, which is the aquatic environment. Such utilization must be sustained to support human beings by carefully maintaining ecological integrity and controlling human behavior.

Global experience shows us capture fisheries has not been sufficient if being managed only by technical persons or groups. As addressed by Kesteven (1973), to be successfully managed, capture fisheries must involve various groups of different disciplines of bio-techno-socio-economic complex. At its first rapid development in the 1970s, capture fisheries were developed significantly in many countries, including Indonesia. However, the development outcome was not necessarily pleasant for everybody. Some fish stocks were depleted due to lack of control of fishing effort and ignorance of decision makers. Such problems were not only prevalent in developing countries but also developed countries or regions where fisheries and marine sciences have been established.

This issue had promoted a significant concern among global communities who then responded by establishing a Code of Conduct for Responsible Fisheries (FAO 1995). This code has gradually become one of the references for decision makers and business players in reconstructing fishing practices around the world. One of the latest development strategies in fisheries management is the concept of the Ecosystem Approach to Fisheries Management. Such thought has been promoted world-wide by the FAO.

In Indonesia, capture fisheries have been significant in supplying animal protein, food security, employment opportunity and livelihood to many coastal and small island communities and trading. The social-economic role of capture fisheries has been very significant and cannot be substituted by other economic sectors. Sustainable fisheries are one of the indicators in the 14th Sustainable Development Goals. Therefore, it is urgent for Indonesia to maintain its direction to achieve and sustain its capture fisheries at a sustainable level. This optimum perspective can be achieved when issues of capture fisheries are not only considered an independent economic sector but must be regarded as a industrial sector that interwoven many commercial, economic sectors in synergy and supported by various disciplines.

At the moment, Indonesia establishes a governance system that positions fisheries resources and fishing industries under an economic sector managed and supervised by the Ministry of Fisheries and Marine Affairs. On the one hand, this system is very positive since fisheries sectors will receive full attention and significant allocation of development funds. On the other hand, the fisheries sector will be exposed to some more significant challenges. An increase in the Indonesia population implies more food demand that may force more exploitation of fish resources from the natural system (i.e., capture fisheries). Rampant illegal fishing and ecosystem destruction may reduce the maximum sustainable yield of fish. Moreover, excessive fishing may occur since poor records on un-utilized catch due to poor on-board handling, discontinued cold-chain system in trading and distribution, or discarded for fish caught incidentally or merely unwanted.

Effort to maintain sustainability of fish resources and capture fisheries should receive full wide attention from many stakeholders, in terms of proper advanced technology, awareness of both fish producers and consumers on environmental issues, high adaptive capacity of fishers to some emerging issues, synergy among economic sectors and new approaches to develop marine and fisheries policy and governance. A collective effort from various stakeholders (not even a single ministry) is required to promote sustainable fisheries. Such effort is a synergized comprehensive approach that should be a reference in constructing short term, mid-term (5 years), and long-term plans of sustainable fisheries (20-25 years).

Trans-disciplinary approaches in directing capture fisheries, research and education are needed since it is strategic in the preparation and development of harmonious policy actions, development of innovative and appropriate technology, institutional development, community empowerment, and inter-sectoral investment.

The central theme of the First Capture Fisheries International Symposium is Transdisciplinary Approaches Promoting Sustainable Marine Fisheries. The idea is the response of Department of Fisheries Resources Utilization, Faculty of Fisheries and Marine Sciences, and Forum Komunikasi Kemitraan Perikanan Tangkap (FK2PT) (translation: the Partnership Communication Forum of Capture Fisheries) on the latest issues of national and regional capture fisheries that need full attention from all stakeholders, i.e., academicians, business players, governments and civil society organizations.

Just the other day, we finished conducting a **national seminar** in this venue yesterday (Thursday, October 17th, 2019) with the same theme but had an emphasize on the Direction of Capture Fisheries Development: Transdisciplinary Approaches Promoting Sustainable Marine Fisheries.

To Indonesia, marine and fisheries are a strategic economic sector that utilizes fish resources, a blessing for Indonesia and global welfare. Such perspective has encouraged and inspired various stakeholders to pay attention to the marine environment including the resources and services generated by the marine environment. A tremendous amount of fish resource (*i.e.*, estimated maximum sustainable yield of 12,5 million tons per year), millions people engaged in the fishing business and its fish supply chain, academicians, employees of many business use fish products, domestic and global seafood demand, and foreign earnings of the country are some examples that stimulate growing interest, concern and expectation of many stakeholders (local and international) on the capture fisheries in Indonesia.

The Government of Indonesia has addressed these issues and expectations by planning and implementing a national fisheries development program. Each President established some focuses of his program, expressed as a priority program of the Ministry of Marine Affairs and Fisheries. However, we are still challenged by sustainability and fairness issues in capture fisheries. Now days, sustainable fisheries, responsible fisheries, environment-friendly fishing, conservation or sustainable fish resources have been jargon that gain popularity among stakeholders. Fishing must be appropriately managed to prevent the fish resource from being overfished. This concern has stimulated stronger actions on monitoring, controlling and surveillance programs targeting IUU Fishing. This effort should be accompanied by other effort. One of the agendas is the development of management approaches that accommodates local characteristics of fish resources, environment, and socio-economic aspects, i.e., management of the eleven fisheries management areas (WPP).

The theme of this symposium should be considered as a reminder for all of us that the problem solutions in the capture fisheries required a comprehensive approach reflected in the contribution of various disciplines, in terms of science and technology, types of industries, socio-cultural aspects, governance scopes, etc. Some of you may remember when you started learning sciences and technology at Faculty of Fisheries, Bogor Agricultural University, one of our teachers said: "There are many things must be done to develop sustainable capture fisheries in Indonesia. Not only development of fishing gear, fishing boats, training fishers, but also we need to build management, policy and governance system, ethical business and trade, the participation of business players, educating and respecting consumers, managing conflicts generated by fisheries, and managing interaction between fisheries sector and other economic sectors.

There are various management concepts available and applicable to manage the capture fisheries. Some of them are *integrated coastal zone management* (UN 1992), a concept outlined in the *Code of Conduct for Responsible Fisheries* (FAO 1995), and *Ecosystem Approach to Fisheries Management* (Staples *et al.* 2014). The fisheries management is also expected to respond to *Sustainable Development Goals*. Also, there are tools for managing fisheries. One of them is *Rapid Appraisal technique for Fisheries* (RAPFISH) that was developed by a group of scientists in the University of British Columbia in 1996 (Pitcher 1999). In a broader scope, the concept of the blue economy provides a fundamental perspective on positioning capture fisheries and its interaction with other productive activities and ecosystems (Pauli 2010).

The Government of Indonesia also gradually adopt and adapt such global values or perspectives to improve national policy and development program of capture fisheries. In IPB University and other universities, the learning process and research have been responding to such values. We can observe some changes in the curriculum and the diversity of academic activities.

Those above are some examples of components that contribute and build *sustainability science* and *transdisciplinary science* of capture fisheries. If not sufficient yet, probably we are at the stage of composing *multi-disciplinary science* of capture fisheries. After this symposium, perhaps we may find the transdisciplinary science and technology for capture fisheries. Therefore, this symposium is not designed for discussing different concepts of transdisciplinary science (Buchori 2019). Let's position this symposium as an effort to convince ourselves that problems in capture fisheries cannot be solved solely by one discipline, one technical group and one economic sector.

In this symposium, we are going to learn about the complexities of fisheries and the need for trans-disciplinary research for promoting the effectiveness of capture fisheries management from Professor Neil Loneragan, PhD from Murdoch University - Australia. Subsequently, we will have Mr. Craig Proctor from Ocean-Atmosphere CSIRO - Hobart, Australia, Dr. Lida Pet Soede from PT Hatfield Indonesia, Mr. Alexander Douglas from Centre for Humanitarian Dialogue - Switzerland, Dr. Darmawan MAMA from Dept of Fisheries Resources Utilization FPIK IPB University and my self-presenting perspectives on approach to solve particular issue of the capture fisheries in this ballroom. After that we will have the opportunity to learn ideas, concerns, experience or solution for the fisheries problems from 20 participants.

Finally, I would like to express our gratitude to the Director General of Products Competitiveness - MMAF for supporting the implementation of this symposium, Dean of Faculty of Fisheries and Marine Sciences - IPB University, representatives of scientific journals, and others whose name cannot be mentioned one-by-one, and indeed all the participants of thus symposium.

Thank you very much.

Wassalamu'alaikum warahmatullahi wabarakatuh.

Dr. Ir M. Fedi A Sondita, MSc
Chairperson of the Symposium Organizing Committee

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PROGRAMS

Friday, October 18th 2019

Time	Agenda	Venue
The 1st Capture Fisheries International Symposium		
07.30 – 08.30	Registration	Foyer
08.30 – 09.00	Opening	Ballroom
09.00 – 09.45	Keynote Speech - Prof Dr. Neil Loneragan, (Murdoch University – Australia)	Ballroom
09.45 – 11.15	Invited Speakers: 1. Mr Craig Proctor (CSIRO – Hobart, Australia) 2. Lida Pet Soede, PhD (PT Hatfield Indonesia) 3. Mr Alexander Douglas (Center for Humanitarian Dialogue, Switzerland) Moderator: Dr Ir Budy Wiryawan (PSP FPIK IPB University)	Ballroom
11.15 – 11.30	Photo session	Ballroom
11.30 – 13.30	Lunch break	Foyer
13:30 – 14.20	Invited Speakers: 1. Dr Ir M Fedi A Sondita, MSc (Dept PSP FPIK IPB University) 2. Dr Ir Darmawan, MAMA (Dept PSP FPIK IPB University) Moderator: PD Dr rer nat habil Sonja Kleinertz (DAAD/Rostock Univ./FPIK IPB Univesity)	Ballroom
14:25 – 15.10	Presentation Session 1	Ballroom, A, B
15.10 – 15.30	Break	Foyer
15.30 – 16.30	Presentation Session 2	Ballroom, A, B
16.30 – 16.40	Closing	Ballroom, A, B

SCHEDULE OF PRESENTATIONS

Friday, October 18th 2019

Session 1 Place: Ballroom Moderator**:** Dr. Ir Ronny I. Wahju, MPhil

Time	Presenter	Presentation Title
14.25-14.40	**Friesland Tuapetel**, Yolanda MTN Apituley, Imelda KE Savitri, Dionisius Bawole, Roy Rahayaan	Species diversity and spawning period of flying fish in waters around Kei Archipelago, Southeast Maluku **(3-10)**
14.40-14.55	**Elva Dwi Harmilia**, Irkhamiawan Ma'ruf	Community Structure and Distribution Pattern of Fish in the Downstream Musi River **(3-25)**
14.55-15.10	**Jamrun Ebbah**, Filemon G. Romero, Sherwin A. Paalan (Philippines)	Sustainability assessment of blue swimming crab (*Portunus pelagicus*) fishery in the Municipalities of Sibutu and Sitangkai, Tawi-Tawi **(3-4)**

Session 2 Place: Ballroom Moderator**:** Dr. M. Riyanto, SPi, MSi

Time	Presenter	Presentation Title
15.30-15.45	**Umi Muawanah**, Armen Zulham, Nendah Kurniasari, Radityo Pramodya, Lathifah Mursyidah	Assessment on the governance of fisheries management in Indonesia **(3-16)**
15.45-16.00	**Widhya Nugroho Satrioajie**, Imam Prakoso, Wildan Ghiffary, Ahmad Baihaki, Umi Muawanah, Christy Desta Pratama, Anta Maulana Nasution, David Kroodsma	The use of vessel monitoring system (VMS) Technology for Identifying compliance in the temporary closure area of the Banda Sea **(3-15)**
16.00-16.15	**Belvi Vatria**, Budy Wiryawan, Eko S. Wiyono, Mulyono S. Baskoro	Livelihood resilience evaluation of small-scale fishermen in North Kayong Regency, Indonesia **(5-14)**
16.15-16.30	**Atikah Nurhayati**, Titin Herawati, Ayi Yustiati	Rethinking discourses on the exclusion of fishery from Jatigede Reservoir's use schemes (**5-8**)

SCHEDULE OF PRESENTATIONS

Friday, October 18th 2019

Session 1 Place: Room A Moderator**:** Dr. Roza Yusfiandayani, SPi

Time	Presenter	Presentation Title
14.25-14.40	**Yanto Anwar**, Tri Wiji Nurani, Mulyono Sumitro Baskoro	Biological and technical aspects of fishing for flying fish egg by fishers in Tual **(1-6)**
14.40-14.55	**Anukorn Boutson**, Takafumi Arimoto	Some observations on the behavior of blue swimming crabs (*Portunus pelagicus*) in the experiment tank to improve the catch efficiency of crab pots **(1-17)**
14.55-15.10	**Delly DP Matrutty**, Stanny R. Siahainenia, Donald Noija, Welem Waileruny	The effect of marine debris on the catchability of bottom gillnet **(1-2)**

Session 2 Place: Room A Moderator**:** Dr Yopi Novita, SPi, MSi

Time	Presenter	Presentation Title
15.30-15.45	**Welem Waileruny**, Daniel D Pelasula, Sani Sarimane, Delly DP Matrutty	Tuna jacket is efficient but not effective **(1-3)**
15.45-16.00	**Komang Iwan Suniada**	Identification of purse seiners behavior using GPS trackers in Bali Strait **(1-13)**
16.00-16.15	**Shanty Manullang**, Agustinus P. Kindangen, Agus Setiawan	The preliminary design and movement of remotely operated vehicle (ROV) **(1-12)**
16.15-16.30	**Erfind Nurdin**, Asep Ma'mun, Asep Priatna, Mahiswara	The relationship between the existence of tuna with environmental factors in the upper layer of thermocline, thermocline and lower layer of thermocline around FADs in Pelabuhanratu, West Java **(1-11)**

SCHEDULE OF PRESENTATIONS

Friday, October 18th 2019

Session 1 Place: Room B Moderator: Prof Dr Ir Ari Purbayanto, MSc

Time	Presenter	Presentation Title
14.25-14.40	**Oktavianto Prastyo Darmono**, Aflaha Abdul Munib, Reinhart Paat	Market value chain analysis of tuna in Sangihe islands, North Sulawesi **(2-26)**
14.40-14.55	**Agus Heri Purnomo**, Nurhayati, Atikah, Efany, Anthon, Zahid, Ahmad, Kusumawati, Rinta, Octavini, Hasta	Seasonal losses in capture fisheries: occurrence, market responses and response constraints **(2-7)**
14.55-15.10	**Rumeaida Mat Piah**, Muhammad Hanif Fadzli	Understanding the sustainability of fisheries resources exploitation from the analysis of maximum sustainable yield (MSY) and fishing effort for maximum sustainable yield (f_{MSY}) **(2-5)**

Session 2 Place: Room B Moderator: Dr Vita R. Kurniawati, SPi, MT

Time	Presenter	Presentation Title
15.30-15.45	**Luky Adrianto**, Abdul Gofar, Akhmad Solihin, Sinta Hasriningtyas, Ayi Ardisastra	Capture fisheries provision: evaluation and legal construction **(2-30)**
15.45-16.00	**Lana Izzul Azkia**, Muhammad F. A. Sondita, Eko S. Wiyono	Potential areas of conflicts among blue swimming crab fishers from Betahwalang, Demak, Central Java **(4-18)**
16.00-16.15	**Nendah Kurniasari**, Ummi Muawanah, Cristina Yuliaty, Riesty Triyanti, Ari Permana, Armen Zulham	Streghthening maritime culture as a source of creative ideas in tourism development **(4-29)**
16.15-16.30	Ateng Supriatna, Audrie Siahainenia, Victor Nikijuluw, Ines Ayostina, Muhammad Khazali, Andi Yaser Fauzan, Berta Matatar, Hanggar Prasetio, Niomi Pridina	Customary Fishing Rights: Community Based Fisheries Management in Buruway Sub-Marine Protected Area Kaimana, West Papua **(4-31)**

ABSTRACT OF KEYNOTE SPEAKER

TRANSDISCIPLINARY APPROACHES FOR ASSESSING DATA-POOR FISHERIES

Professor Neil Loneragan, PhD
Environmental and Conservation Sciences, College of SHEE, Murdoch University, Australia
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ABSTRACT

Data-poor fisheries, where no time-series of catch and effort are available, pose significant global challenges for management and conservation. Strategies for obtaining data, assessing the status of stocks and providing advice to management require alternative, trans-disciplinary approaches to those for more data-rich fisheries. Data-poor fisheries include small-scale fisheries in coastal waters and estuaries, particularly those in remote regions such as north-western Australia and eastern Indonesia and recreational/leisure fisheries. Incorporating the social dimensions of fisheries and fisher knowledge provides a means of enhancing understanding of these fisheries and their management. This is illustrated through examples of engaging fishers in eliciting their perceptions of estuarine crab fisheries in temperate, south-western Australia and in shark and grouper fisheries of eastern Indonesia. Interviews of crab fishers focused on i) historical changes in the average size of crabs and fishing effort; ii) concerns about the fishery and iii) management solutions supported by fishers for the fishery. The results show differences in the perceived changes, reported concerns and supported solutions among the recreational fishing communities in the three estuaries and between the recreational and commercial fishers one estuary. Research on shark and grouper fisheries involved interviews with fishers and fishing communities and implementing novel approaches to data collection that involved shark fishers and non-government agencies. These examples highlight the value of incorporating social research and a partnership approach for assessing data-limited fisheries.

Keywords: fisher knowledge, social dimensions, partnership

Biography

Neil Loneragan PhD is a Professor of Marine Ecology and Conservation at Murdoch University, Western Australia. He studied at University of Western Australia (BSc) then MSc and PhD Murdoch University, Perth – Australia, with a postdoctoral fellowship at the University of Waterloo. Prior to joining Murdoch University in 2005, he spent 15 years with CSIRO (based in Queensland) researching coastal habitats, fisheries and biodiversity. Currently he also teaches undergraduates in Ecology, Marine and Estuarine Biology and the Sustainable Management of Fish and Wildlife populations. His current research covers data-limited fisheries and fisheries aquaculture-based-enhancement fisheries. He was the Chair of the International Scientific Committee for the 4th ISSESR (Shanghai, 2011 – over 150 participants) and the organising committee for ISSESR5 in Sydney (2015). He have been councillor for the Asian Fisheries Society (2011 to 2016, 2019-2022), including time as Vice-President in 2014.

ABSTRACTS OF INVITED SPEAKERS

APPLICATION OF TECHNOLOGIES TOWARDS IMPROVED CAPTURE FISHERIES MANAGEMENT: RELEVANCE TO INDONESIA'S TUNA FISHERIES

Craig H. Proctor

CSIRO Oceans and Atmosphere, Hobart, Tasmania, Australia

Abstract

Tuna fisheries are a highly important component of Indonesia's marine capture fisheries, contributing around 12% of the nation's overall marine production. These fisheries are recognized as being perhaps the most complex of any fisheries worldwide; large industrial and small-scale/artisanal sectors, vast numbers of vessels of different types and sizes, multi-gears, and the ever-increasing numbers of Fish Aggregating Devices (FADs), and operating across a large proportion of the vast archipelago, the adjacent oceanic waters, and the complexities of the various regional jurisdictions. Challenges for management of these fisheries are therefore complex. Improved data collection (in terms of amount and quality) is viewed as essential to current Harvest Strategy development and new technologies are at the forefront of meeting data requirements. E-monitoring is expanding among fisheries worldwide and has already made in-roads into Indonesia's tuna fisheries. Spot Trace (satellite tracking) and other methods of 'capturing' vessel movements and operations are improving data on catch per unit effort, whilst also assisting in combating IUU fishing. Developments of on-board camera and video monitoring systems are ongoing but have already shown potential for more efficient information collection on fishing operations and catch composition. Smart apps are enabling rapid reporting by skippers, observers, and enumerators of catch and fishing trip parameters; providing data that can be applied to improved management (including compliance) and to improved fisheries assessments.

Keywords: e-monitoring and reporting, management challenges, tuna

Biography

Mr Craig H Proctor is a Fisheries Scientist at Oceans & Atmosphere, CSIRO (Commonwealth Scientific and Industrial Research Organisation), Hobart, Tasmania, Australia. Craig has been a fisheries scientist at CSIRO for 32 years and for the past 17 years has been involved in collaborations with Indonesia on marine fisheries; collaborations focused primarily on assisting Indonesia with improving systems of fisheries data collection and in developing Harvest Strategies for the tuna fisheries,

BENEFITS AND CHALLENGES OF APPLYING VMS FOR MANAGEMENT OF FISHING VESSELS <30GT IN INDONESIA

Lida Pet-Soede[1], Priska Widyastuti[1], Sigit Prasetyo[1], I Gede Mahendra[1], Fariz Acron[2] and Erwis Sinisuka[3]

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Abstract

A project, funded by the UK government through the UK Space Agency and implemented by Inmarsat Inc., was designed to consider benefits of satellite technology to improve the policing of illegal fishing and conservation areas, to make the Indonesian fishing industry more sustainable and to enhance fishers' livelihoods through improved accessibility and detail of information for fisheries management. The project revealed that VMS can improve: 1) safety at sea, 2) efficiency of and commercial returns from fishing operations, and 3) social well-being through use of two-way text message features. Additional conclusions include that the technology exists to apply VMS on small vessels. Challenges related to the availability of electricity on small vessels to run the VMS can be overcome. Captains and crew members of vessels <30 GT participating in the pilot project were very satisfied with the features of the Pointrek VMS, particularly its two-way communication functionalities. However, the initial price of this system and monthly service were perceived prohibitive. This paper considers some options to overcome the cost barrier of the hardware and service, particularly because various users can reap significant benefits of the VMS+ solution. Private sector actors, insurance companies, and other potential VMS+ generated information users are invited to consider cost-sharing options.

Keywords: fisheries management, VMS, safety.

Biography

Lida Pet-Soede is a Dutch conservation and fisheries management expert. She holds degrees in Tropical Fisheries Biology and Management, socio-economics of developing countries, and fish culture. She has coastal habitat survey expertise. She supervised more than 100 students, many of which have jobs in conservation and fisheries management. Dr. Pet-Soede, Lida. Leader Marine and Coastal Development Unit, PT Hatfield Indonesia, LIPI Building 3rd Floor, JL. IR. H. Juanda 18, Bogor 16122, INDONESIA

FISH WARS, FISH PEACE: THE ROLE OF FISHERIES IN CAUSING AND RESOLVING CONFLICT

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Abstract

Fishing will be on the front lines of Asia's future conflicts. Around the world 11% of all militarised disputes between countries involve fisheries, fishers, or fishing vessels. This presentation will briefly outline historical cases of fishing disputes that brought states to the verge of war. It will then explore how fishing issues affect the dispute over the South China Sea. The fishing industry is of profound economic importance for the region, but the South China Sea's fish stocks are declining rapidly. This scarcity could exacerbate tensions between claimant states. And the disputes themselves hamper the ability to take the cooperative actions required to address declining stocks.

To prevent this decline there have been some efforts to begin to establish better fisheries cooperation between claimants in the South China Sea. The presentations outline the Centre for Humanitarian Dialogue's recent efforts to build consensus on the status of high-priority stocks, improve cooperation between Marine Protected Areas, and build support for joint declaration where there is already common practice. These measures could not only contribute to the sustainable management of fish stocks, but also build the trust required to resolve other parts of the South China Sea dispute. The presentation will end by reflecting on the experience of using fisheries management as a tool for preventing and resolving conflict.

Keywords: conflict prevention, conflict resolution; fisheries management

Biography

Mr Alexander Douglas is an Adviser at the Centre for Humanitarian Dialogue, an international organisations specialising in conflict resolution. He has worked on conflict and governance issues in Nepal, Liberia, Myanmar, Indonesia, the Philippines and the South China Sea. Alex has two degrees from Flinders University in Australia, one in International Studies and the other in Laws and Legal Practice. His address: The Centre for Humanitarian Dialogue, 114 rue de Lausanne, 1202 Geneva, Switzerland,

PROPOSED ZONING PROCESS FOR DECENTRALIZATION OF FISHERIES MANAGEMENT IN INDONESIA

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Abstract

Fishing communities in Indonesia can access fish resources with less effort compared to those who operate fishing boats in high-seas. Their advantage is well reflected in simple technology and management they practiced with outcomes in short fishing trips and low productivity. The fishing communities have adapted themselves to the characteristics of fish and marine environment which is influenced by regional climate. These three factors have forced the formation of various types of fisheries stakeholders who compete with each other for fish and marine space. Optimum benefit of marine resources can be achieved if the interaction of stakeholders is controlled by zoning approach. An intention to decentralize Indonesia fisheries management to the 11 major fisheries areas can be implemented by conducting zoning of marine use for capture fisheries in a systematic process. The process consisting activities on: (1) understanding temporal and spatial characteristics of the fish resources and marine environment, (2) identification of various characteristics of the utilization of fish resources and marine space, (3) establishing requirements and limits of the utilization of fish resources, (4) determining time periods and areas that promote economic efficiency of fish resource utilization, and (5) allocating and distributing access among the fisheries stakeholders. The scattered approaches being practiced for fisheries management now should be improved by engaging more diverse disciplines, especially in discovering spatial and temporan aspects of information needed.

Keywords: marine fisheries, spatial, temporal zoning

Biography

Muhammad Fedi Alfiadi Sondita is a senior lecturer of IPB University since 1987 with educational background and interests in fisheries (Sarjana), coastal zone management (MSc) and marine ecology (PhD). His experience includes marine fisheries-conservation and capacity building projects implemented/supervised by UNDP, WorldBank, USAID, Conservation International, Rare, BAPPENAS, MMAF and Mitra Bahari. His address: FPIK IPB, Kampus IPB Darmaga, Bogor 16680 INDONESIA

REGULATORY FRAMEWORK FOR SPATIAL-BASED FISHERIES MANAGEMENT

Darmawan

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Abstract

Management of fisheries resources, as well as other natural resources, should be managed following its ecological boundaries as one way to implement sustainable management. In reality, challenges of managing ecological limits are difficult because human beings tend to set governance models through a set of various administrative boundary lines. Those boundaries more often disregard the environmental boundaries of the supposedly managed resources. As a result, each governmental authority has been applying different approaches or even conflicting methods in managing fisheries resources. Due to different interest, resources sustainability and potential economic value is greatly affected. Indonesia had setup a foundation toward spatial and ecosystem based fisheries management since 1999, even before the Minister of Fisheries and Marine Affairs formally established. However, these spatial approach called Fisheries Management Area (FMA) has been neglected without clear jurisdiction nor clear institutional framework to manage fisheries resources properly. Nevertheless, in the last five years, Ministry of Fisheries and Marine Affairs has been revitalizing FMA through establishing a management body and developed management plans for all eleven FMA throughout Indonesia. It is interesting to discuss if these FMA management bodies could manage fisheries resources and thus ensuring the sustainability of the resources and also obtain economic benefits for many stakeholders who depend on the resources, under the current regulatory framework.

Keywords: regulatory framework, spatial-based management

Biography

Dr Ir Darmawan, MAMA, has been working as a professional for approximately 30 years in the fields of fisheries and marine, conservation and the environment. The scope of work includes regional Asia-Pacific cooperation, human resource development, regional governance development, and fisheries policy development. Having experience developing institutions, designing and implementing work programs in various government institutions (BAPPENAS, KKP), non-governmental organizations (TNC, Rare), international donors (UNDP, USAID, Rockefeller), universities and the private world. He is currently an Associate Professor in the Department of Fisheries Resource Utilization, Faculty of Fisheries and Marine Sciences, IPB University.

ABSTRACTS PRESENTED

SubTheme 1
Fisheries Technology and Technical Application

[ID Presentation: 1-2]

THE EFFECT OF MARINE DEBRIS ON THE CATCHABILITY OF BOTTOM GILLNET

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ABSTRACT

Changes in internal and external factors during the operation of a bottom gillnet will affect its catchability. The presence of marine debris in the ocean is suspected to reduce its catchability. This study was aimed to identify the factors that lead to decreasing catchability of bottom gillnets and to calculate the reduction in catchability due to changes in the hanging ratio caused by marine debris. This research was conducted in May-June 2019 in Ambon Bay. Experimental fishing using a set of bottom gillnet was carried out with ten replications to identify such factors affecting the catchability. Reduction in the catchability was determined from the portion (%) of net area covered by garbage, changes in the hanging ratio and the tension of the net due to entangled and twisted trashes on the net. The marine debris that influenced the performance of the bottom gillnets were garbage stuck on the net, trashes entangled on the webs and debris masked the net. The reduction of mesh with free garbage, changes in mesh opening and net tension resulted in a decrease in the catchability of the bottom gillnet by 20-50%.

Keywords: hanging ratio, internal factors, catchability

Biography

Dr. Ir. Delly D. P. Matrutty, MSi is a Lecturer at the Department of Capture Fisheries/Faculty of Fisheries and Marine Science, Pattimura University, Ambon, Indonesia. She has completed the doktoral program in the Capture Fisheries Technology Department of IPB University in 2014.

[ID Presentation: 1-3]

TUNA JACKET IS EFFICIENT BUT NOT EFFECTIVE

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ABSTRACT

The small-scale fishers in Maluku catch tuna generally use hand lines. The tuna is then processed as tuna loin for export. Jacket tuna or ring was introduced to improve the efficiency and effectiveness of the handline fishing. However, some fishers stop using it because of some perceived disadvantages. This issue needs to be clarified objectively. This research was aimed to calculate the efficiency and efficacy of the use of tuna jacket and to describe fisher's reasons for not using it anymore. Data were collected through interviews and experimental fishing comparing the handline operation with and without the tuna jacket. The result showed that the size range of the tuna caught during the experiment was 27-80 kg/fish. The average hauling duration for fishing with tuna jacket was 10.1 minutes/fish whereas for fishing without tuna jacket was 31.8 minutes/fish. In terms of time spent, it means that fishing with tuna jacket was more efficient than without jacket tuna. However, fishers considered the use of tuna jacket may cause higher possibility of fish to escape from the hooks and the jacket may snap the mainline.

Keywords: fishing efficiency, handlines, jacket tuna

Biography

Dr. Ir. Welem Waileruny, MSi, is a Lecturer at the Department of Capture Fisheries/Faculty of Fisheries and Marine Science, Pattimura University, Ambon, Indonesia. He has completed the doktoral program in the Capture Fisheries Technology Department of IPB University in 2014.

[ID Presentation: 1-6]

BIOLOGICAL AND TECHNICAL ASPECTS OF FISHING FOR FLYING FISH EGG BY FISHERS IN TUAL

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ABSTRACT

Flying fish eggs have high economic value in both domestic and export markets. It makes egg of flying fish is the main target for fishers in Tual. They use rectangular bale-bale fishing gear measuring 1.5 - 3.0 m x 0.75 - 1.5 m (P x L) made of bamboo. Biological and technical information of the fisheries are essential for managing the flying fish fisheries. This study was aimed to analyze catch per unit effort (CPUE), fishing season, technical aspects of fishing gear, fishing method, and fishing ground around Tual. Primary data were gathered through interviews with fishers while data on the production of flying fish egg were collected from Tual Nusantara Fisheries Port (PPN). Data were analyzed by calculating CPUE and basic statistical parameters. The results showed an increase in CPUE from year 2015 to 2017, the peak fishing season occurred in May and June. Fishing activities took place in the waters near Tual City and Tanimbar Kei. Fishers are recommended to use fishing gear of more environmentally friendly, to reduce the number of bale-bale by 20% fishing gear and to limit the catch or production.

Keywords: biological aspects, flying fish egg, technical aspects, Tual

Biography

Yanto Anwar, Amd, SPi, MSc, has completed an undergraduate program at UNPATTI Ambon and a Master's degree from the Bogor Univeristy. During education, he was the chairperson of the Campus Propagation Institute at POLIKANT Tual, the head of the Elat Student Youth Association, Coordinator of the Study Center of the Faculty of Communication Sciences at the Pancasila University in the Maluku region, and PMII branch manager Southeast of Maluku.

[ID Presentation: 1-11]

THE RELATIONSHIP BETWEEN THE EXISTENCE OF TUNA WITH ENVIRONMENTAL FACTORS IN THE UPPER LAYER OF THERMOCLINE, THERMOCLINE AND LOWER LAYER OF THERMOCLINE AROUND FADS IN PELABUHANRATU, WEST JAVA

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ABSTRACT

Knowledge on fish behavior and its relationship to environmental factors are important for developing more effective fishing methods. In sustainable fisheries concept, the catch is no longer about the quantity but more on the quality of the catch, *e.g*. length of fish. Size composisiton of tuna has been recognized to be associated with depths of their swimming layers. The purpose of this study was to determine the relationship between the existence of yellowfin tuna and environmental factors in the upper thermocline (Zone-Up), the thermocline and the lower thermocline (Zone-Un) layers. Data collection was conducted from November 24th to December 3rd 2015 off Pelabuhanratu Bay. Fish around FADs was detected and observed using an echosounder at an interval of 6 hours: morning (6:00-08:00 AM), daytime (12:00-02:00 PM), afternoon (06:00-08:00 PM) and mid-night (00:00-02:00 AM) local time. Environmental factors were measured using CTD Sea bird SBE 19 plus V2. The measured environmental parameters are temperature (°C), salinity (PSU), dissolved oxygen (mg/l), chlorophyll (mg/m^3), conductivity (S/m) and seawater density (kg/m^3). The significant factors for the fish abundance in the Zone-Up layer were temperature and salinity while in both the thermocline and Zone-Un layers was temperature.

Keywords: underwater acoustics, yellowfin tuna, FADs, Palabuhanratu

Biography

Dr. Erfind Nurdin, MSi is a Researcher at Research Institute for Marine Fisheries, Cibinong-Indonesia. He has completed Diploma program in Fishing technology at Agriculture Polytechnic of Hassanuddin University in 1997, Bachelor Degree (S1) in utilization of fishery resources at Satya Negara Indonesia University in 2002, Master Degree in the Capture Fisheries Technology Department of IPB University in 2011, and Doctoral Degree in the Capture Fisheries Technology Department of IPB University in 2017.

[ID Presentation: 1-12]

THE PRELIMINARY DESIGN AND MOVEMENT OF REMOTELY OPERATED VEHICLE (ROV)

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ABSTRACT

The study aims to design a mini Remote Operated Vehicles (ROV) based on remote control underwater robot and test its performance in calm water. The mini ROV design was developed through some processes which were drawing designs with software, selecting components to build the mini ROV, designing mechanical construction, designing electronic installation, and the final stage was integrating the entire design process. The research concluded the best design of Mini ROV and it was named "AF-150114". The mini ROV is an underwater robot that can move in water with X, Y and Z axes. It has a dimension of 65 cm in length, 50 cm in width, and 25 cm in height. The ROV body is made of fibreglass-based material coated with sealant to properly maintain impermeability. Its forward and backward movements were generated by a two-blade propeller whereas ascending and descending movements were controlled by a ballast pump system.

Keywords: design, movement, ROV

Biography

Shanty Manullang is the Head of the Shipping Engineering Department, Faculty of Marine Technology, Darma Persada University.

[ID Presentation: 1-13]

IDENTIFICATION OF PURSE SEINERS BEHAVIOR USING GPS TRACKERS IN BALI STRAIT

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ABSTRACT

Purse seine is the main type of fishing gear operated in Bali strait due to its suitability for catching small pelagic fishes available in the area, such as scads, tuna mackerels, chub mackerela or sardines. The fishing ground can be divided into two regions, *i.e.*, areas adjacent to the eastern part of Java and areas adjacent to the western coast of Bali. Even though fishing locations can be predicted, information on actual operations of the boats operated purse seine, including their tracks and the fishing locations, has never been recorded. Therefore this research was critical. Information on the movements of purse seiners was monitored using GPS trackers. The data were then analyzed with open-source QGIS software to differentiate cruising mode from drifting mode during fishing operations. It was confirmed that fishing operations mostly conducted along the western coastal waters of Bali. It was also confirmed that purse seine was operated at night for 30 minutes to 3 hours. The operation of purse seiners will change according to seasonal changes in the environment.

Keywords: fishing operation, purse seiner, GPS tracker, Bali strait

Biography

Komang Iwan Suniada, SPi, MSi, is a Researcher at the Institute for Marine Research and Observation (IMRO), Ministry of Marine Affairs and Fisheries, Republic of Indonesia. He was completed Bachelor Degree (S1) at the Department of Marine Science and Technology, Faculty of Fisheries and Marine Sciences, Bogor Agricultural University (IPB), Bogor, Indonesia and completed Master Degree (S2) at Department of Environmental Science, Udayana University-CReSOS, Indonesia. Research interest is Environmental and habitat models for marine fisheries, the impact of climate change to the environmental and habitat based on remote sensing.

[ID Presentation: 1-17]

SOME OBSERVATIONS ON THE BEHAVIOR OF BLUE SWIMMING CRABS (*Portunus pelagicus*) IN THE EXPERIMENTAL TANK TO IMPROVE THE CATCH EFFICIENCY OF CRAB POTS

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ABSTRACT

The pot targeting blue swimming crab *(Portunus pelagicus)* is an important gear and widely conducted in Thai waters. This study aimed to improve the catch efficiency of the pot by observing crab behavior in an experimental tank. The process of crab entrapment through the entrance via a slope net with three different mesh sizes was recorded with a video camera. The crawling performance and the time taken on the net with smaller mesh sizes of 18 and 25 mm were compared with the conventional pot (38 mm). The experiment used 12 crabs with carapace lengths between 35.0-45.0 mm. The time taken by the crabs to entrapped from the first touch at the slope net tended to be quicker when the mesh size was smaller. Crawling patterns on the net with smaller mesh sizes were more likely to be straight forward and more accessible than the conventional. Three crabs gave up their attempts to enter the pot through the net of mesh size 38 mm and none for the net of mesh size 25 mm and 18 mm. The crabs passed through the slope net by crawling and never returned when they reach the trailing edge of the net. After being entrapped, they fed then mostly crawled around the bottom panel and attempted to escape. Possibility to improve the catch efficiency in responding to the crab behavior was discussed.

Keywords: behavior, observation, crab pot, *Portunus pelagicus*

Biography

Dr. Anukorn Boutson graduated (Ph.D.) from Tokyo University of Marine Science and Technology (TUMSAT) in 2008. He has been working as a lecturer at the Faculty of Fisheries, Kasetsart University, Bangkok, Thailand since 2000 until the present. He is interested in coastal capture fisheries, fishing gear impacts including bycatch and discard issues, and sustainable capture fisheries.

SubTheme 2 Fisheries Business and Trade

[ID Presentation: 2-5]

UNDERSTANDING THE SUSTAINABILITY OF FISHERIES RESOURCES EXPLOITATION FROM THE ANALYSIS OF MAXIMUM SUSTAINABLE YIELD (MSY) AND FISHING EFFORT FOR MAXIMUM SUSTAINABLE YIELD (f_{MSY})

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ABSTRACT

The information on the catch, effort, species composition, and whether it is sustainable or not are crucial in understanding the status of fisheries and fisheries resources needed for developing a fisheries management plan. This study aims to understand the state of fisheries resource exploitation in Malaysia emphasizing the most commercially exploited species, *i.e.*, groupers. In this present study, surplus production models were used to predict the exploitation status of the groupers using annual catch and effort data of 10 years. This study showed some variation in the values of maximum sustainable yield (MSY) and fishing effort for maximum sustainable yield (f_{MSY}) of groupers for different fishing areas in Malaysia which reflect the sustainable amount of fish landed and the number of operating fishing vessels. The findings from this study will be benefited in a better data analysis and in managing the fisheries resources in the future.

Keywords: fisheries management, fisheries resources, Malaysia, sustainable exploitation

Biography

Rumeaida Mat Piah, PhD is a Lecturer at University Malaysia Terengganu, Malaysia. Her PhD was obtained from Southern Cross University, Australia. She is a member in Malaysian Fisheries Society. Her research mainly on fish population dynamics in relation to fisheries management with various experience, including marking and tagging of fish by PIT tags and Acoustic tags to identify population size, growth rate and migration pattern, the diet and feeding habits of fish, fish diversity and abundance and reproductive aspects. She is particularly interested in determining the age of fish through observation on the sectioned otoliths and the length frequency distributions.

[ID Presentation: 2-7]

SEASONAL LOSSES IN CAPTURE FISHERIES: OCCURRENCE, MARKET RESPONSES, AND RESPONSE CONSTRAINTS*

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ABSTRACT

Seasonal losses are claimed to pose a significant challenge to capture fishery market players. This includes the difficulty of fishers, traders, processors to maintain production and consumers to secure stable quality fish supply. This paper aims to confirm seasonal fish loss, its resulting issues, and the links to management scheme. The study, conducted in 2016, followed a case study approach in Palabuhanratu, Blanakan, Probolinggo, Sendangbiru, Pekalongan, Cilacap, Pati. Interviews were carried out with fishers, fresh-fish traders, processors, processed-fish traders, consumers, each represented by ten respondents/location. Results show that seasonal variation caused significant fish damage. The market responded to this with options available although constrained by some factors. Therefore, it is recommended that the problem can be handled more appropriately through accommodation in a harvest control rule scheme. Referring to this scheme, the insertion of quality loss aspects must get emphasis mainly on two things which are the formulation of management goal and determination of a harvest control rule. The purpose can be described as formulating harvesting strategies that bring the minimum quality loss. Meanwhile, harvest control rules aim at imposing harvest levels within the range that is sufficient to sustain stocks, avoid fish deterioration in the peak season, and allow for manageable peak season oversupply to be stored in preparation for the low season.

Keywords: capture fisheries, harvest control rule, harvest strategy, seasonal fish loss

Biography

Prof. Agus Heri Purnomo has a Resource Economist, Research Center for Marine and Fisheries Socio-economics, Ministry of Marine Affairs and Fisheries, Jakarta, Indonesia. Technical and social scientific background and bureaucratic experience brought Agus Heri to integrative research activities and policy formulations. SME's development, climate change, social ecological system, business design, and value chain illustrate the range of research he is engaged in. Currently, he coordinates an international collaborative study on seaweed, including value chain, product characterization, process improvement, and waste utilization.

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[ID Presentation: 2-26]

MARKET VALUE CHAIN ANALYSIS OF TUNA IN SANGIHE ISLANDS, NORTH SULAWESI

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ABSTRACT

Tuna has become an important commodity with an average price of IDR 40,000/kg. This commodity plays an essential role in improving the economy of fishing communities in the Sangihe Islands. The problem of this research was on the inefficiency of quality variables affects tuna economic value. The study of the tuna market value chain was needed to determine the efficiency and the added value in each supply chain. The study was conducted in June - August 2019 using participatory descriptive mapping methods. The results showed that tuna has four supply chains: 1) from fishers to the market; 2) from fishers to collectors and markets; 3) from fishers to collectors and then proceed to the fish processing industries and; 4) from fishers to small collectors, continue to large collectors and then to fish processing industries. The tuna was mostly ended up at the fish processing industries. The most significant added value of IDR 35,000/kg was generated when fishers sold the fish to collectors and then to the fish processing industries. Recommendations for tuna management were good handling process include cutting the supply chain with product assistance during the transportation process by stakeholders, adding cold storage facilities and ice block factories in Sangihe Islands and improving the role of the Sangihe Islands Government in expanding market access through air transport distribution system.

Keywords: supply chain, tuna, added value, Sangihe Islands

Biography

Oktavianto Prastyo Darmono, SPi, MSi earned his first degree from Bogor Agricultural Univeristy in 2012, then his MSi from the same university in 2016. He has a big interest in fisheries management and marine conservation iisues in Indonesia.

[ID Presentation: 2-30]

CAPTURE FISHERIES PROVISION: EVALUATION AND LEGAL CONSTRUCTION

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ABSTRACT

Capture fisheries have been faced by fish scarcity threat. Therefore, one of the actions to control the fish stock degradation rate is to enact fisheries subsidies prohibition. It is because fisheries subsidies provision is considered as a 'culprit' of overcapacity. The study was aimed to analyse the rules of capture fisheries subsidies provision in Indonesia, to evaluate the implementation of capture fisheries subsidies provision and to develop legal frame of fisheries subsidies for sustainable capture fisheries. The study was conducted at the Fisheries Management Area of Republic of Indonesia (WPPNRI) 572, 573 and 718 in July – August 2019. The study was descriptive by using a normative juridical method towards the legal base of capture fisheries subsidies provision, and also by using quantitative descriptive analysis method in mapping the implementation of capture fisheries subsidies provision. The result of this study showed that Indonesian law provides fisheries subsidies and government aid. The application of fisheries subsidies provision was dominated non-productively for fisherman insurance purposes. Statutory construction to be considered is Presidential Decree which contains the identification of capture fisheries development needs as well as the procedure of assessment of regional management performance and or types of fisheries.

Keywords: fisheries subsidies, fish scarcity, legal construction

Biography

Dr Ir Luky Adrianto, MSc is a coastal & marine social-economist at Faculty of Fisheries and Marine Sciences – IPB University. He earned his first degree from Bogor Agricultural Univeristy in 1993, then his MSc and PhD were achieved from Kagoshima University – Japan in 1998 and 2004, respectively. He has been active in assiting fisheries management development in Indonesia.

SubTheme 3 Fisheries Policy, Management, and Governance

[ID Presentation: 3-4]

SUSTAINABILITY ASSESSMENT OF BLUE SWIMMING CRAB (*Portunus pelagicus*) FISHERY IN THE MUNICIPALITIES OF SIBUTU AND SITANGKAI, TAWI-TAWI

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ABSTRACT

A study on sustainability assessment of blue swimming crab fishery was conducted in the municipalities of Sibutu and Sitangkai for 12 months (February 2016-January 2017). The study aimed to assess the fish in terms of sizes, volumes, catch rates and areas of the collection. It also evaluated the fishery practices to come up with management and policy recommendations for its sustainability. The study used a survey questionnaire to gather information from key informants who were fishermen and traders. A detailed monitoring sheet was used to record catch data on blue crab fishery. An estimate of 60,339.50 kg production of blue swimming crab for the duration of the study with an estimated market value of PhP3,016,975.00 in the local market. During the peak month of September, as total production of 10,276.50 kg was recorded and during the lean month of April, it was 1,315.00 kg. This showed a higher peak of recruitment pattern during North-East monsoon, lower peak southwest monsoon. During test fishing, April was the productive month with 132 samples, 35 male (26.51%) and 97 female (73.48%), 18 of the female crabs were gravid. Crab maturity carapace-width ranged from 10.5 cm to 15.5 cm. To improve and sustain blue swimming crab fishery, this study recommends that blue crab fishery management ordinance be passed and implemented by the local government.

Keywords: sustainability, recruitment, blue swimming crab

Biography

Prof. Jamrun Ebbah is the Chairman of the Marine Fisheries Department, Faculty College of Fisheries, Mindanao State University, Tawi-Tawi College of Technology and Oceanography, Sanga-Sanga, Bongao, Tawi-Tawi. He is 64 years old, Filipino Citizen, Badjao Tribe, patronizing Islam, Bachelor of Science in Marine Fisheries, Bachelor of Science in Fisheries Education, Master of Education, Chairman Marine Fisheries Department, Diver, Researcher, Faculty of College of Education and College of Fisheries, Mindanao State University, Tawi-Tawi College of Technology and Oceanography, Sanga-Sanga, Bongao, Tawi-Tawi, Philippines.

[ID Presentation: 5-8]

RETHINKING DISCOURSES ON THE EXCLUSION OF FISHERY FROM JATIGEDE RESERVOIR'S USE SCHEMES

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ABSTRACT

Jatigede reservoir was built in the district of Sumedang in 2017, targetting several benefits, including farmland irrigation, flood protection, and hydropower supply. However, the development of this reservoir has been done at high social costs. Among options to overcome this problem is by providing opportunity to dislocated people to develop a simple reservoir-based livelihood, namely, capture fishery. This research aims to assess feasibility and identify issues of preparing a fishery activity scheme that can exist side by side with all other interests currently justifying the exclusion of fisheries Jatigede Reservoir use schemes, and formulate policy recommendations. A combination of methodological tools were adopted and these included: (i) reviews of reports on fishery practices and management of a number adjacent reservoirs, (ii) consultation with relevant resource persons, and (iii) focus group discussion. The result of this research shows that the most potential problems confronting the efforts of developing sustainable fishery involving these dislocated people were: (i) use conflicts involving multi parties, sectors, and interests, (ii) lack of a proper reservoir's water area zoning, and (iii) poor people's skill and knowledge on fisheries-based entrepreneurs. Given such problems, this research found that to promote fishery for dislocated Jatigede farmers, a series of interventions are needed and this ranges from internal interventions (including self capacity improvement among the people) to external interventions such as establishing effective zoning and relevant legal supports.

Keywords: fishery, management, Jatigede, reservoir

Biography

Dr. Atikah NURHAYATI is a Socio-economics Lecturer, Faculty of Fisheries and Marine Science, Padjadjaran University, Bandung, Indonesia. She was completing a doctoral program. The university recruited Atikah as a lecturer who is responsible for fisheries-socio-economic related courses. Besides this academic position, structural positions are also held by her. Currently, Atikah is the faculty's academic manager, a new job following her past appointment, namely program manager.

[ID Presentation: 3-10]

SPECIES DIVERSITY AND SPAWNING PERIOD OF FLYING FISH IN WATERS AROUND KEI ISLAND, SOUTHEAST MALUKU

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ABSTRACT

Waters Kei Island is categorized as a potential fishing ground of flying fish, especially its eggs, due to the high economic value. However, information regarding the stock is still limited. This research was aimed to analyze the types of flying fish and their spawning periods. Data were collected through observation by following the Pattorani boat and local fishermen's boat. An interview in three 'Ohoi verified collected data,' i.e., Laggiar Fer, Ur Pulau, and Tanimbar Key. The research was conducted from June 2018 to July 2019. The results showed that there were ten species and five families of flying fish. The highest number of catches was from the genus of *Cypselurus*, *Hirundichthys*, and *Cheilopogon* respectively. *Cypselurus poecilopterus, Hirundichthys oxycephalus*, *Cheilopogon cyanopterus*, and *Cheilopogon suttoni* were the four most dominant species within the catch. Spawning period and the first spawning size for *C. poecilopterus* was on May-June and 28-29 cm, *Hirundichthys oxycephalus* in June-July (20-22 cm), *Cheilopogon cyanopterus* on August (19-20 cm), Cheilopogon suttoni on September (26-27 cm). This information can be used as a foundation to manage flying fish resources in waters around Kei Island for sustainable usage.

Keywords: species diversity, spawning period, flying fish, Kei Waters

Biography

Dr. Friesland Tuapetel SPi. MSi is a Lecturer at Faculty of Fisheries and Marine Science, Pattimura University, Maluku, Indonesia. He has completed Bachelor's Degree (S1) at Pattimura University, Maluku, Indonesia, Bogor, completed Master Degree (S2) at Sam Ratulangi University, Manado, Indonesia, and completed Doctoral Degree (S3) at Hasanuddin University, Makassar, Indonesia.

[ID Presentation: 3-15]

THE USE OF VESSEL MONITORING SYSTEM (VMS) TECHNOLOGY FOR IDENTIFYING COMPLIANCE IN THE TEMPORARY CLOSURE AREA

OF THE BANDA SEA

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ABSTRACT

The fisheries management in the Banda Sea is entering a new chapter when the Ministry of Marine Affairs and Fisheries issued the regulation No. 4/2015 stating a huge temporary closure area encompassing 126-132°E, 4-6°S during October–December each year. The closure is intended to protect the spawning and breeding ground of yellowfin tuna *(Thunnus albacares)*. The regulation was declared in January 2015, but the results have not yet been assessed. This study attempts to identify the profiles of the fishing vessels that operated in the Banda Sea based on VMS data during the 2014-2017 period and their compliance to such regulation. Total vessels operated in the area were 249 units in 2014 then it decreased to 104 units in 2015 and increased to 214 units in 2016. By contrast, the number of vessels increased significantly to 747 units in 2017. Before the closure, 44 units of fishing vessels operated in the area. The number decreased considerably to 10 boats in 2015 and 7 boats in 2016. However, the violation increased to 32 boats in 2017. The study recommends integrated monitoring and surveillance actions to address increased violations in the closure area.

Keywords**:** Banda Sea, closure area, compliance

Biography

Widhya Nugroho Satrioajie, SPi, MSi is a Researcher at the Center for Deep-Sea Research, Indonesian Institute of Sciences (P2LD LIPI) Guru-Guru Poka Ambon, Indonesia. He has completed a Bachelor's Degree (S1) and a Master's Degree (S2) at Diponegoro University, Semarang, Indonesia.

[ID Presentation: 3-16]

ASSESSMENT ON THE GOVERNANCE OF FISHERIES MANAGEMENT IN INDONESIA

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ABSTRACT

The Ministry of Marine Affairs and Fisheries endorsed the governance of Fisheries Management Areas (FMAs) through Directorate General Decision Letter in the late 2017. However, its implementation has been facing many challenges. At the same time, the Ministry of Planning and Development had drafted the Long Term Development Plan (RPJMN) of the year 2020-2024 which stated that strengthening the governance of FMAs will be one of the fisheries priority programs. This study aims to asses the current design and implementation of FMA governance namely the Fishery Management Councils (FMC). Data and information were gathered through field observation, interviews with policymakers and members of FMCs in several FMAs, and analyzed by formal and informal analyses. Legal analysis was done by comparing the written guideline of FMC on function and task, including laws and regulations supporting fisheries governance with actual practices at the FMC. The informal analysis evaluates key management functions and attributes of the existing FMC governance and compare them with the ideal function. The results show the tasks and features of each component of FMC as written on the documents marginally/partially implemented by FMC members. The study also found that there are many challenges and gaps in the operationalization of FMC.

Keywords: governance, fisheries management area, Indonesia

Biography

Dr. Umi Muawanah graduated from various science and technology backgrounds. She completed Bachelor Degree (S1) and Master Degree at Chemical Engineering Sepuluh Nopember Institut of Technology Surabaya Indonesia, Diploma of Environmental Management at Maastricht School of Management (MsM), the Netherlands, Master Degree of Resource and Environmental Economics at University of Rhode Island, USA, Master Degree of Resource Economics and Agriculture, and Ph.D. of Resource Economics and Agriculture at UCONN, USA.

[ID Presentation: 3-25]

COMMUNITY STRUCTURE AND DISTRIBUTION PATTERN OF FISH IN THE DOWNSTREAM OF MUSI RIVER

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ABSTRACT

The downstream of Musi River is one of signficant fishing grounds in the coastal area of South Sumatera Province. While daily spatial distribution of fish in estuarine areas is determined by tidal pattern, seasonal spatial distribution of the fish is expected to be more associated with climate dynamics. Such pattern of change is important to be recognized by fisheries managers, especially in developing preparedness response to abrupt change threatening fish resources. The fish community structure and distribution pattern between two consecutive months, however, may not be significantly different. This study was carried out to compare the fish community structure and fish distribution in the area between the end of transitional season (June 2018) and the beginning of dry season (July 2018). Taxonomic composition and fish community structure were identified from catches of local fishers each month. Data collection activities were carried out at five stations where an ecological estuarine gradient is expected. For each site, small differences in biodiversity, evenness, domination and dispersion indices were identified between the two months, except at Selat Cemara for the first four indices and Upang for dispersion index. Such spatial-temporal pattern can be used as an ecological baseline for managing the local fisheries.

Keywords: diversity, downstream, fish distribution, Musi river.

Biography

Elva Dwi Harmilia, SSi, MSi is an Assistant Professor in the Aquaculture Department, Head of the Fisheries Lab, Faculty of Agriculture, Universitas Muhammadiyah Palembang (UMP). She finished her undergraduate education at the Faculty of Mathematics and Natural Sciences Universitas Sriwijaya and postgraduate program at the Environmental Management University of Sriwijaya. She was a water chemistry-quality analyst in Palembang BRPPU and has been a lecturer at the Faculty of Agriculture UMP since 2015 and active in research and community service activities. She is an authors of several several scientific articles from her activities at BRPPU and the current work place.

SubTheme 4 Community and Stakeholder

[ID Presentation: 4-18]

POTENTIAL AREAS OF CONFLICTS AMONG BLUE SWIMMING CRAB FISHERS FROM BETAHWALANG, DEMAK, CENTRAL JAVA

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ABSTRACT

Fishers in Betahwalang use three types of fishing gears: mini trawls, bottom gillnets, and collapsible traps to catch blue swimming crabs (*Portunus pelagicus*). The same target species implies that those three types of gears will compete for fishing locations. Potential conflict between fishers can be reduced with a zoning arrangement that allocates space and period of fishing season for each type of fishing unit. There is no such zoning arrangement available for crab fishing in Java sea. Such zoning can be developed by considering several factors; one of them is the overlaps in fishing location. This study aimed to identify areas of the potential conflicts for crab fishing grounds in the Java Sea, mainly off Kendal, Semarang, Demak and Jepara Regencies. The map of overlapping fishing locations was developed based on interviews with 90 fishers who represented different fishing units. Potential areas of conflicts during westerly and easterly monsoons were located off the coast between Semarang dan Betahwalang, near Tanjung Mas, Semarang and near Betahwalang, Demak. In the area near Ujungbatu and Bandengan, Jepara the overlaps occurred only during easterly monsoon while in the area near Menco-Babalan, Demak the overlaps occurred in westerly monsoon. Provincial Government of Central Java should pay attention to these five fishing zones to anticipate potential conflicts among fishers from Betahwalang.

Keywords: blue swimming crab, conflicts, fishing, zoning

Biography

Lana I. Azkia, SPi, is a student of the graduate Program of Fisheries Resources Utilization, Faculty of Fisheries and Marine Sciences, IPB University. She completed a Bachelor's Degree (S1) at the Department of Fisheries Resources Utilization, Faculty of Fisheries and Marine Sciences, Diponegoro University, Semarang. In 2016-2017, she worked as Assistance Fisheries Consultant in Departement of Agriculture and Fisheries Salatiga, Central Java (under the authority of Ministry of Marine Affairs and Fisheries Republic of Indonesian).

[ID Presentation: 4-29]

STREGHTHENING MARITIME CULTURE AS A SOURCE OF CREATIVE IDEAS IN TOURISM DEVELOPMENT

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ABSTRACT

Development of the tourism industry, which leads to mass tourism, often weakens the local culture. This paper aims to provide direction on how culture is a source of creative ideas for tourism development. The study was conducted in Mandalika, Central Lombok District. Data were collected from respondents through in-depth interviews and focused discussions which then analyzed with a descriptive approach. The results show that tourism development in Mandalika brought a positive economic impact on the community but also tends to undermine their culture. The community in Mandalika felt they lost some identities due to the influx of Balinese personality, loss of the "Madak Mare" tradition, and local's behavior, and mimicking tourist habits that are not following Islamic values, *e.g.*, drinking. These concerns can be prevented by 1) raising awareness that socio-cultural values reflected in traditions, philosophy of life, legend, and distinctive architecture need to be preserved, 2) involving communities in planning, implementation, and supervision of the management of tourist areas, 3) providing training on packaging cultural attraction, developing creative traditional crafts, fashion, interior design, documentary arts, and traditional performances, 4) providing opportunity for local cultures to express themselves by making cultural compromises. Thus, the tourism sector can be developed without eroding the cultural identity of the Mandalika community.

Keywords: Mandalika, creative economy

[ID Presentation: 4-31]

CUSTOMARY FISHING RIGHTS: COMMUNITY BASED FISHERIES MANAGEMENT IN BURUWAY SUB-MARINE PROTECTED AREA KAIMANA, WEST PAPUA, INDONESIA

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ABSTRACT

Sub-MPA Buruway is one of four Sub-MPAs within Kaimana MPA, West Papua. The Sub-MPA consists of coastal waters adjacent to three villages in the Buruway District, i.e. Kambala, Nusaulan, and Adijaya villages. The Kaimana MPA managers needs to identify potential local community that promotes MPA management effectiveness. The aim of the study is to describe existing institutional arrangement in the Sub-MPA Buruway that addresses fisheries issues. Rapid appraisal for fisheries management (RAFM) was implemented in September 2018 – March 2019 to collect data on customary fishing rights adopted by the three villages. The results indicated that the customary rights promote protection and sustainability use of the ecosystem and fish resources. Petuanan, the leader of the clans, is the owner of the resources and has the right to control the use of fisheries resources. Sasi has been implemented to control harvest of several sedentary marine faunas. The local customary rights allow fishers from each village to fish in coastal waters of the other villages. This traditional governing system is strategic in helping the MPA, especially in controlling access to local resources and promoting community engagement. Technical assistance is needed to improve village leader capacity, especially in addressing issues on increasing demand for seafood products.

Keywords: customary fishing rights, community-based fisheries management, MPA, fish resources

Biography

Dr. Ateng Supriatna is a fisheries and aquaculture program manager. He has obtained his master's in the Asian Institute of Technology in Thailand and earns his doctoral degree in IPB. He has work in the Agricultural Research Agency of the Ministry of Agriculture (1999-2004), Ministry of Marine Affairs and Fisheries (2004-2017), and National Project Manager in FAO Indonesia (2017-2019).

SubTheme 5 Spatial Management

[ID Presentation: 5-14]

LIVELIHOOD RESILIENCE EVALUATION OF SMALL-SCALE FISHERMEN IN NORTH KAYONG REGENCY, INDONESIA

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ABSTRACT

The welfare of small fishers is very closely related to their livelihood. Effective interventions to increase the capacity of small-scale fishers require accurate information about the resilience of fishermen's livelihoods. The purpose of this study was to analyze the status of the livelihood resilience of small-scale purse seine fishers from Maya Island, North Kayong Regency. Data collection was carried using the fisheries livelihoods resilience communities check. Multidimensional scaling and leverage analysis through Rapfish software were used to analyze the data. This study found that the status of the resilience of livelihood as a boat owner is sufficient with the highest average index value of 71.77 whereas that of boat captain was also sufficient but with an average index value of 54.06. Meanwhile the status of the resilience of livelihoods of crews was less resilient with an average index value of 47.84. There were 11 sensitive factors which influenced the livelihood resilience of the studied group, namely: natural hazards, ship mooring, land resource, geographical isolation, wife's work, processing/added value, ice availability, remittances, social security, justice/sanction, and support/participation. This study concludes that to increase the capacity of fishers, it is necessary to pay attention to differences in the status of livelihood resilience and the sensitive factors that influence it.

Keywords: management, poverty, vulnerability, welfare

Biography

Dr. Vatria, Belvi, Associate Professor, Department of Fisheries and Marine Science, Pontianak State Polytechnic, Pontianak, Indonesia. He was born in Jakarta on July 12, 1976. The last education is a doctoral program in marine fisheries technology, currently works as a lecturer in the Department of Marine Science and Fisheries at Pontianak State Polytechnic with a functional position as an associate professor.

Full Papers

COMMUNITY STRUCTURE AND DISTRIBUTION PATTERN OF FISH IN THE DOWNSTREAM OF MUSI RIVER

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ABSTRACT

The downstream of Musi River is one of signficant fishing grounds in the coastal area of South Sumatera Province. While daily spatial distribution of fish in estuarine areas is determined by tidal pattern, seasonal spatial distribution of the fish is expected to be more associated with climate dynamics. Such pattern of change is important to be recognized by fisheries managers, especially in developing preparedness response to abrupt change threatening fish resources. The fish community structure and distribution pattern between two consecutive months, however, may not be significantly different. This study was carried out to compare the fish community structure and fish distribution in the area between the end of transitional season (June 2018) and the beginning of dry season (July 2018). Taxonomic composition and fish community structure were identified from catches of local fishers each month. Data collection activities were carried out at five stations where an ecological estuarine gradient is expected. For each site, small differences in biodiversity, evenness, domination and dispersion indices were identified between the two months, except at Selat Cemara for the first four indices and Upang for dispersion index. Such spatial-temporal pattern can be used as an ecological baseline for managing the local fisheries.

Keywords: diversity, downstream of Musi river, fish distribution

INTRODUCTION

Musi River, the largest river in Indonesia, is very important to the people of South Sumatera Province. Its downstream zone starts from Tebing Abang Village to the estuarine areas (Utomo and Nasution, 1995). The water current in this zone is strongly influenced by currents from the upstream area and Bangka Strait. As a semi-enclosed water body where freshwater and seawater meet (Barnes and Green 1971), the fish community in an estuary usually consists of a mixture of freshwater and marine fishes. Husnah *et al*. (2008) reported at least 210 species fish from the Musi River, while Khorul *et al*. (2008) reported 113 fish species from the estuary based on their study in 2006-2007.

Fishing with various types of fishing gear is one of the prominent activities in the estuary of Musi. Fishing activities in this area were more intensive than one in the upstream zone (Husnah *et al*. 2002). There are at least 13 types of fishing gear used by local fishers (Wardoyo *et al.* 2001). These are tuguk or *filtering devices* (*i.e*., tuguk line, tuguk buoyant and tuguk beetle), castnet, gillnets (*e.g.,* net bags, nets barracks, and cawang nets), mini trawl, *sondong* and *seser* for shrimps (pushes), crab pots, longlines and *blad* (*tidal - beach barrier*).

The large potential of fish resources in the estuarine area of the Musi River attracts more fishers to fish in the area. Meanwhile, along the river, there is a growing development of agro-industries and general industries that may degrade the quality of fish habitats and impose more threats to the fish population (Makmur, 2004). Such complex environmental pressures may have determined the nature of fish resources, and their impact may prevail in the short future. Since a baseline is normally needed in developing fisheries management, this study provides information on the current community structure and distribution pattern of fish in the area.

MATERIALS AND METHODS

The study was conducted in June (the end of the transition season) until July (the beginning of the dry season) in the downstream Musi River. The downstream zone of Musi river was represented by five sites, *i.e*., Upang (station 1), Selat Cemara (station 2), Pulau Keramat (station 3), Pulau Payung (station 4) and Tanjung Buyut (station 5), see Figure 1. Fish samples were collected weekly over two months by enumerators using the *blad* at each site (Figure 2). While the height of the blads was about 2 m, their length varied with location condition. The lengths of the blads at Upang was 150 meters, Selat Cemara was 400 meters, Pulau Keramat was 300 meters, Pulau Keramat was 400 meters and Tanjung Buyut was 600 meters. The blads were erected using logs or bamboos which wer hich is about two meters from one log to the other. The enumerator set the blad during low tide but the net was not lowered until high tide. The fish was collected during low tide in the following day (Figure 3).

The number of fish samples was counted on-site at each station and then taken to the campus laboratory for their identification. The fish samples were grouped according to the habitat they were collected from, *i.e*., river, brackish water, and marine fishes. Their identification followed Kottelat *et al*. (1993) and Saanin (1994). The fish assemblages from the samples were analyzed for determining diversity, uniformity, and dominance indices. The environmental condition was described in terms of dissolved oxygen, salinity, pH, total phosphorus, ammonia, and water temperature; their measurements were conducted according to APHA (1980).

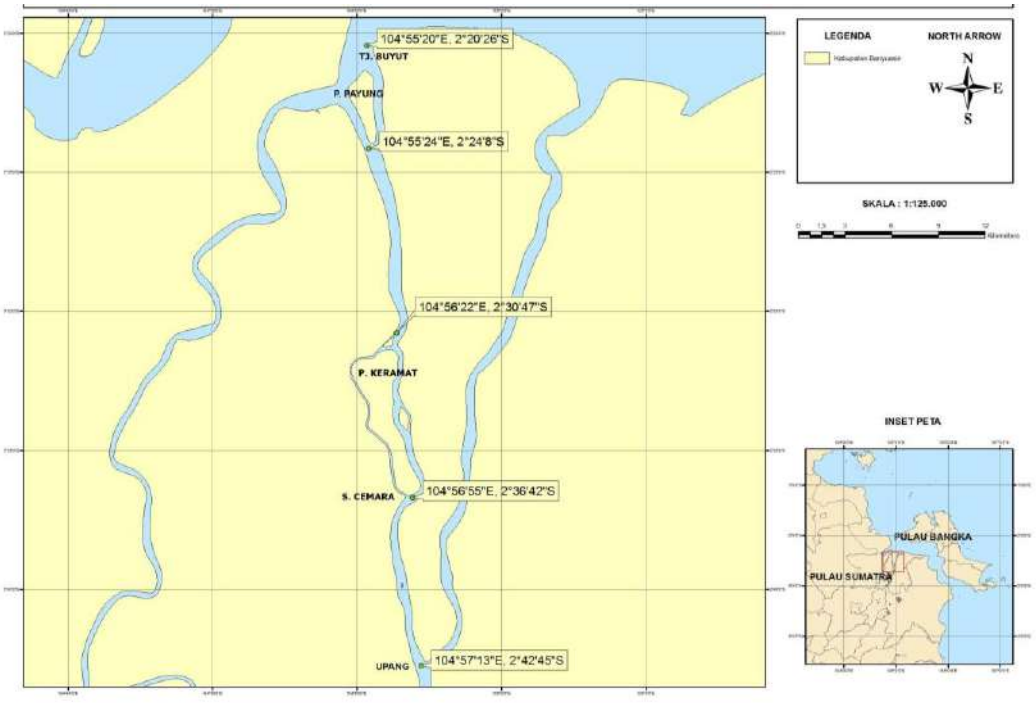

Figure 1. Sampling stations in the downstreams of Musi River, South Sumatera

Figure 2. A blad – tidal beach barrier - with net hung before high tide in Tanjung Buyut

Figure 3. Enumerators collected fish being trapped at the shore during low tide at Pulau Payung

The Shannon-Wiener index (*H'*) was used to determine the diversity of the fish assemblages; its calculation described in Odum (1993) is: $H' = -\sum_{i=1}^{S} P_i \ln P_i$ where P_i is a fraction that indicates the numerical portion of species *i* in the entire assemblages (n_i/N); n_i is a number of individuals of species *i* and *N* is the total number of fish individuals in the entire assemblage. If $H' < 1$ or low diversity, then the fish community is classified unstable; if $1 \leq H' \leq 3$ or moderate diversity, then the community is classified moderately stable; if $H' > 3$ or high diversity, then the community is classified relatively stable.

Uniformity index (*E*) indicates the numerical equality of species abundance (Odum, 1993). According to Odum (1993), its formula to calculate it is $E = H'.H'_{max}$ or $E = \frac{H'}{\ln S}$ where *H' is Shannon-Wiener* diversity index, *H'max* is *ln S,* and *S* is the total number of species in the community. According to Krebs (1989) *in* Odum (1996), if $E > 0.6$ then the community consists of various species with an equal numerical contribution to the total number of fish in the community (high uniformity); if $0,4 \leq E \leq 0.6$ then the community consists of various species with moderate uniformity; if $E \leq 0.4$ then some species are dominant or have a higher numerical contribution to the community (low uniformity).

Simpson index (Odum, 1996) is used to determine the dominance index (*C*) in the community. The formula for its calculation is: $C = \sum \left[\frac{n_i}{N}\right]^2$ where n_i is number of individuals for each species, *N* is the total number of individuals in the community. If $0 < C < 0.5$ then no species dominates the community numerically; if $0.5 < C < 1$ then there is a species dominating the community numerically.

Distribution patterns of fish from the five sites were determined by Morisita dispersion index (I_d) (Brower and Zar, 1977). The formula for its calculation is: $I_d = n \frac{\sum_{i=1}^{n} x_i{}^2 - N}{N(N-1)}$ where *n* is the number of sampling stations, *N* is the total number of individuals in *n* stations, x_i is the number of individuals at the *i*-th station. If $I_d < 1$, then the fish disperse in uniform pattern; if $I_d = 1$, then the fish disperse in a random pattern; $I_d > 1$ then the fish individuals disperse in clusters.

RESULTS AND DISCUSSION

Aquatic Environmental Condition

The aquatic condition of Tanjung Buyut (station 5) appeared to be the only marine environment among the five stations. The salinity at this station ranged from 2.9 to 5.3‰ during both seasons. Such a level of salinity was most likely due to the intrusion of seawater upstream during the seasons. In contrast, the levels of salinity in the four other stations were low due to a lack of seawater influence. The acidity of the waters in both the end of the transition season and the beginning of the dry season ranged from 6,5 – 8,0. A water with low acidity (<6.5) will affect the aquatic biology community, such as decereasing plankton and benthic diversity (Effendi, 2000). The dissolved oxygen in the study area ranged from 4.83 to 5.7 mg/l, higher than was reported by Harmilia (2016), *i.e.*, ranged from 3.1-3.8 mg/l. According to Harmilia (2016) that getting to the downstream there is a slight increase in the value of total phosphorus and ammonia, this is releted to the accumulation of agricultural, plantation, industrial areas, and residential activities. Conditions in the downstream part are a continuation of the processes that occur upstream (Welcome, 1979). Total phosphorus (0.071-0.1932mg/l) and ammonia (0.032-0.053mg/l) showed an increasing trend from station 1 to station 5 (Tanjung Buyut) but still suitable for fish. Effendi (2000) reports that ammonia in waters that exceed 0.2mg/l can be toxic for several types of fish. All temperature at all stations ranged from 29-32.5°C this values as good for fish life. Optimal temperature for fish life in tropical waters ranged from 28-32°C (Kordi and Tancung, 2005).

Table 1. Aquatic environmental condition at the downstream of Musi river

Parameter	The end of the transition season (June)					The beginning of dry season (July)				
	Up	SC	PK	PP	TB	Up	SC	PK	PP	TB
Salinity (o/oo)	0	0	0	0	5	0	0	0	0	2,5
pH	6,5	6,5	6,5	7,5	8	6	6	6	7	7,5
DO (mg/l)	5,7	5,5	5,21	5,41	5,56	5,0	5,13	4,98	4,83	4,83
Total Phosphorus (mg/l)	0,071	0,0831	0,0830	0,0912	0,0943	0,0740	0,0931	0,1430	0,1490	0,1932
Ammonia (mg/l)	0,032	0,035	0,035	0,047	0,049	0,041	0,041	0,046	0,051	0,053
T (oC)	30	31	30	31	31	29	30	32,5	29,5	30

Stations: Up : Upang, SC : Selat Cemara, PK: Pulau Keramat, PP: Pulau Payung, TB: Tanjung buyut

Fish Composition

A total of 809 fish samples at the end of the transition season consisted of 30 families and 52 species (Table 2). The samples can be grouped into 17 families of fresh water fish (696 specimens), four families of brackish water fish (51 specimens), and nine families of marine fish (62 specimens). The catch from Upang, Selat Cemara, Pulau Keramat, and Pulau Payung Island was dominated by seluang (*Rasbora argyrotaenia*), a member of family *Cyprinidae.* The 686 fish samples collected in the beginning of dry season were members of 28 families and 44 species (Table 3). These samples can be grouped into 15 families of freshwater fish (417 specimens), four families of brackish fish (184 specimens), and nine families of marine fish (85 specimens).

Some brackish water fish and marine fish belonging to *stenohaline* or organisms that have narrow salinity tolerance may have difficulty in staying in low salinity waters, such as at the four sites other than the estuarine site at Tanjung Buyut. For the end of the transition season, the quantity of catch from the station Tanjung Buyut was significant. This was likely due to the high productivity of phytoplankton and macrophyte in the estuary (Supriharyono 2007). Organic materials originated from the surrounding terrestrials promote local fertility that generates abundant food for the fish in the estuary.

Mullets (*Moolgarda seheli*) and giant prawns (*Macrobracium rosenbegii)* were found at each station because they are brackish organisms with wide salinity tolerance (*euryhaline*). Seluang (*Rasbora argyrotaenia)* was found at every station except at Tanjung Buyut because this species is freshwater fish that live in rivers and swamps. Before flood season, the fish can be easily caught because it swims freely near the surface chasing foods. During the dry season, seluang started hiding under the trees because they cannot stand warmer water (BRPPU, 2007).

The results of research by Gaffar et al., (2007) at the estuary of the Upang River, the diversity of the types of catches of the splint amounted to 47 species with a diversity index of 2.874 while the catches in 2018 were fewer namely 43 species of fish. This is due to catching in 2007 carried out for one year around 135 trip/year so that the possibility of catching more fish. While research conducted in 2018 was only carried out for two months with eight trips.

Table 2. Distribution of fish in the downstream zone of Musi River at the end of transition season (June 2018)

Family	Stations					Numbers
	Upang	Selat Cemara	Pulau Keramat	Pulau Payung	Tanjung Buyut	
Freshwater fish						
Ambassidae	-	-	-	-	5	5
Bagridae	15	14	16	-	18	63
Channidae	1	-	-	-	-	1
Cichlidae	16	-	5	-	-	21
Clupeidae	-	-	-	-	3	3
Cyprinidae	84	128	86	84	-	382
Dohaioididae	-	-	5	14	-	19
Eleotridae	-	3	-	-	-	3
Gobiidae	3	-	1	12	18	34
Mastacembelidae	4	10	8	-	-	22
Notopteridae	-	2	-	-	-	2
Palaemonidae	9	-	21	20	63	113
Pangasidae	-	-	6	-	-	6
Polynemidae	3	-	-	-	2	5
Sciaenidae	-	-	1	-	3	4
Siluridae	2	1	1	-	-	4
Toxotidae	5	-	1	3	-	9

Table 2 (cont.).

Family	Stations					Numbers
	Upang	Selat Cemara	Pulau Keramat	Pulau Payung	Tanjung Buyut	
Brackish water fish						
Ariidae	-	-	-	1	-	1
Belonidae	3	-	-	1	4	8
Mugilidae	-	-	3	9	18	30
Plotosidae	-	-	6	1	5	12
Marine fish						
Chaetodontidae	-	-	-	-	16	16
Clupeidae	1	-	-	-	3	4
Cynoglassus	-	-	-	2	2	4
Haemulidae	-	-	-	1	-	1
Hemirhamphidae	-	-	-	15	-	15
Muraenidae	-	-	4	-	6	10
Soleidae	1	-	-	-	3	4
Stromateidae	-	-	-	-	4	4
Tetraodontidae	-	-	-	-	4	4
Total number of fish:	147	158	164	163	177	809
Total fish families:	13	6	12	12	17	(30)

Table 3. Distribution of fish in the downstream zone of Musi River at the beginning of dry season (July 2018)

Family	Stations					Number
	Upang	Selat Cemara	Pulau Keramat	Pulau Payung	Tanjung Buyut	
Freshwater fish:						
Ambassidae	-	14	3	-	1	18
Bagridae	6	22	16	3	2	49
Cichlidae	6	-	-	-	1	7
Claridae	4	-	3	-	-	7
Cyprinidae	-	57	39	4	-	100
Dohaioididae	-	1	4	9	-	14
Gobiidae	-	-	2	-	6	8
Mastacembelidae	2	6	1	-	-	9
Notopteridae	-	1	-	- -	-	1
Palaemonidae	9	11	25	35	41	121
Pangasidae	2	2	-	28	-	32
Polynemidae	3	6	8	-	3	20
Siluridae	6	11	-	-	-	17
Sromateidae	-	-	4	-	-	4
Toxotidae	-	7	2	1		10

Table 3. (cont.)

Family	Stations					Number
	Upang	Selat Cemara	Pulau Keramat	Pulau Payung	Tanjung Buyut	
Brackish water fish:						
Ariidae	-	-	-	1	22	23
Belonidae	-	16	3	3	-	22
Mugilidae	4	12	27	6	86	135
Plotosidae	-	-	1	1	2	4
Marine fish:						
Chaetodontidae	-	9	6	-	12	27
Cynoglassus	-	-	2	1	2	5
Cynoglossidae	-	-	1	-	-	1
Diceratiidae	-	-	2	-	3	5
Hemirhamphidae	-	-	8	2	2	12
Lutjanidae	-	-	-	-	5	5
Muraenidae	-	-	-	-	1	1
Sciaenidae	-	5	2	-	9	16
Trygonidae	-	-	-	-	13	13
Total number of fish:	42	180	159	94	211	686
Number of fish families:	9	15	20	12	17	28

The diversity index (H') of fish assemblages at all stations was moderate, both in the end of transition season and the beginning of dry season (Table 4 and Table 5). Such value indicates the fish assemblages were moderately stable but in Pulau Payung the value tends to be low. The fish assemblages were exposed to stable salinity levels, except in Tanjung Buyut. Significant changes in physical and chemical factors, such as during wet or flood season, may change the structure of fish assemblages, *i.e*., species composition. This effect is likely significant to *stenohaline* organisms. During the end of transition season, there were no dominant species in the fish assemblages in each site (C < 0.5). This situation correlated with a relatively high diversity index (Odum, 1996).

Table 4. Diversity (H'), uniformity (E), and domination (C) indices of fish assemblages sampled at the end of transition season (June 2018).

No	Stations	H'	Diversity	E	Uniformity	C	Domination
1	Upang	1.7351	Moderate	0.9853	High	0.3247	No dominant species
2	Selat Cemara	1.2373	Moderate	0.6826	High	0.4972	No dominant species
3	Pulau Keramat	1.9799	Moderate	0.8074	High	0.2217	No dominant species
4	Pulau Payung	1.6081	Moderate	0.6386	High	0.3049	No dominant species
5	Tanjung Buyut	2.0330	Moderate	0.9985	High	0.1918	No dominant species

The uniformity index (E) at all stations has a high uniformity (E> 6) but for Pulau Payung and Selat Cemara the values tend to be low. This is because the fish that are caught are from "settling fish" such as Gobiidae family (*Glossogobius aureus*, *Glossogobius matanensis*, *Glossogobius biocellatus*, and *Glossogobius intermedius*), Bagridae family (*Mystus bimaculatus*, *Mystus gulio*, and *Mystus wolffi*), Plotosidae family (*Plotosus canius* and *Paraplotasus albialabris*) and also migratory fish such as tilapia (*Oreochromis nilotica*), mullets from the Mugilidae family (*Liza macrolepis* and *Mugil cephalus*), stingray

(*Oreochromis nilotica*), which only come to find food or spawn. The dominance index (C) at all stations has no dominant species (C<5). According to Odum (1996), high diversity values indicate alow concentration of dominance but in Tanjung Buyut has the value tends to be low.

Table 5. Diversity (H'), uniformity (E), and domination (C) index of fish assemblages sampled at the beginning of dry season (July 2018).

No.	Stations	H'	Diversity	E	Uniformity	C	Domination
1	Upang	1.6763	Moderate	0.9410	High	0.1722	No dominant species
2	Selat Cemara	2.3274	Moderate	0.9949	High	0.1337	No dominant species
3	Pulau Keramat	2.0695	Moderate	0.9468	High	0.1535	No dominant species
4	Pulau Payung	1.7581	Moderate	0.8270	High	0.2454	No dominant species
5	Tanjung Buyut	1.9530	Moderate	0.8118	High	0.2258	No dominant species

The diversity index of fish assemblages in all sites in the beginning of dry season was moderate but in Upang the value tends to be low. The uniformity level of the assemblages was high in each site but in Selat Cemara the value tends to be low. During the transitional season, there were no species numerically dominating the assemblages. Such a situation was probably due to abundant food for fish, although the water debit was lower than that in the previous season but the value for Selat Cemara tends to be low.

Distribution Patterns of Fish Communities

Morisita distribution index values at the end of the transition season at five stations ranged from 0.249 to 0.313. This shows I_d <1, which means that the pattern of fish distribution at each station is uniform. This can occur because of competition in foraging, considering that at the end of the transition season, the river water begins to recede, and the discharge is not as high as in the rainy season. Tarumingkeng (1994) states that uniform fish distribution patterns can be caused by minus interactions between individuals, such as competition in foraging.

Table 6. Dispersal pattern of fish community (Morisita Index) in the end of transition and the beginning of dry seasons

No	Stations	The End of the transition season		The beginning of dry Season	
		Morisita dispersion Index	Dispersion patterm	Morisita dispersion Index	Dispersion pattern
1	Upang	0,249	Uniform	1,19	Clustered
2	Selat Cemara	0,283	Uniform	0,269	Uniform
3	Pulau Keramat	0,299	Uniform	0,299	Uniform
4	Pulau Payung	0,31	Uniform	0,446	Uniform
5	Tanjung Buyut	0,313	Uniform	0,211	Uniform

At the beginning of the dry season, the Morisita index values ranged from 0.211 to 1.19. For station 1 (Upang) with I_d > 1 is 1.19, which means it has a clustered fish distribution pattern. This is because the fish caught are fish or fish originating from the area itself. Besides that, the fish caught are dominated by freshwater fish with a number of 439 records, which are their habitat so that these fish are more likely to live in groups either looking for food or spawning. Asyari and Fattah (2011) stated that fish food is a living biota (animals and plants) that can be consumed by fish in their habitats, such as plants (macrophytes), algae, plankton, shrimp, worms, benthos, insects and larvae.

At stations 2-4 has a uniform pattern of fish distribution with I_d <1. This can happen because, at the beginning of the dry season, there is a decline in water and reduced river water discharge so that the food supply is not much. Detritus-eating fish for example. Detritus eater fishes find it difficult to find food because river water does not flood the coast and does not reach land so that falling leaves and rot do not get carried away by river water, so competition occurs between detritus eater fish in searching for food. According to Asyari and Fattah (2011), the benefits of detritus in waters are for the natural food

of fish that live in these waters. Examples of detritus fish are mullet fish from the Mugilidae family. Research from Algiffary et al. (2018), the composition of the mullet food found in the study was divided into three major groups, namely 21 types of periphyton, nine larvae organisms, and detritus.

CONCLUSION

1. Quality of waters in the downstream of the Musi River based on the chemistry-physics of the waters during the end of transition season and the beginning of dry season is still good for aquatic biota life and values are not much different between the two seasons.
2. The fish community in the downstream zone of Musi River at the end of the transition season (June 2018) consisted of 52 species from 30 families while that at the beginning of the dry season (July 2018) consisted of 44 species from 28 families.
3. The fish community in the study area was characterized by moderate diversity, high uniformity, and no dominating species but only Selat Cemara the value tends to be low.
4. Fish distribution patterns downstream of the Musi River based on the Morisita dispersion index at the end of the transition season indicate that Stations I until V form a uniform pattern. And at the beginning of the dry season, only Station I forms a grouping pattern, others Stations form uniform pattern.

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CUSTOMARY FISHING RIGHTS: COMMUNITY-BASED FISHERIES MANAGEMENT IN BURUWAY SUB MARINE PROTECTED AREA, WEST PAPUA

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ABSTRACT

Sub-MPA Buruway is one of four Sub-MPAs within Kaimana MPA, West Papua. The Sub-MPA consists of coastal waters adjacent to three villages in the Buruway District, i.e. Kambala, Nusaulan, and Adijaya villages. The Kaimana MPA managers needs to identify potential local community that promotes MPA management effectiveness. The aim of the study is to describe existing institutional arrangement in the Sub-MPA Buruway that addresses fisheries issues. Rapid appraisal for fisheries management (RAFM) was implemented in September 2018 – March 2019 to collect data on customary fishing rights adopted by the three villages. The results indicated that the customary rights promote protection and sustainability use of the ecosystem and fish resources. *Petuanan*, the leader of the clans, is the owner of the resources and has the right to control the use of fisheries resources. *Sasi* has been implemented to control harvest of several sedentary marine faunas. The local customary rights allow fishers from each village to fish in coastal waters of the other villages. This traditional governing system is strategic in helping the MPA, especially in controlling access to local resources and promoting community engagement. Technical assistance is needed to improve village leader capacity, especially in addressing issues on increasing demand for seafood products.

Keywords: traditional management, customary fishing rights, MPA

INTRODUCTION

Community-based fisheries management (CBFM) allows community groups to develop a management strategy which accommodate their own needs, aspirations and conditions (Pomeroy, 1994). This type of management is strongly based on fishing rights that are defined and determined by communities themselves or passed on by their ancestors. It is implemented by the communities which are all members involved since the beginning (such as formation) and the implementation of the regulation, to the enforcement of management measures, surveillance and monitoring with the higher acceptability and strong commitment by the communities.

Indonesia, a country with diverse cultures, poses a variety model of existing CBFMs. For examples, the *Sasi* system is well known in Maluku and Papua (Nikijuluw 1994). Similarly, Aceh coastal communities have been observing the *Panglima Laut* system, and Sulawesi boasts numerous systems for traditional marine and fisheries management (Nikijuluw 1995, Nikijukluw 1997). In North Sulawesi, the community develop a local regulation describing that malalugis (*Decapterus*) can only be caught with bamboo traps, locally named *seke,* which are collectively owned by the community. Meanwhile in South Sulawesi, the local community established a local regulation saying that all community members can fish around parrompong (a kind of fish aggregating device) if they use hook lines.

In addressing fisheries issues, the Government of Indonesia has been focusing on strategic approaches through the establishment of marine protected areas (MPAs). This approach has been implemented by the West Papua Governor with the establishment of Kaimana Marine Protected Areas (Kaimana MPA) in 2018 and then approved by the Minister of Marine Affairs and Fisheries in 2019 (Ministerial a Decree No. 25/KEPMEN-KP/2019). Kaimana MPA is one of the significant contributors to the national target of marine conservation in Indonesia. The MPA covers significant areas of the Bird's Head Seascape (499,804.13 ha) situated in the Southeast of West Papua Province (Figure 1). The MPA consists of four Sub-MPA areas, *i.e.* Buruway, Etna, Triton Bay, and Arguni Bay. The MPA

contributes the establishment of fish resource management for sustainable practices and benefit to local communities whose livelihood and cultures are strongly connected with these areas. The Kaimana MPA is expected to be managed effectively in addressing various issues relevant to the MPA objectives. Such a large sized area promotes effectiveness of conservation of marine animals with large home range, however to a limited extent, constrains MPA management functioning. Therefore, the managers must develop strategic approach by engaging local community leaderships from various places near or adjacent the management area. Therefore, the Kaimana MPA managers needs to identify local community potential in governing the community and the resources that exist in the MPA.

The Sub-MPA Buruway consists of coastal waters adjacent to three villages in the Buruway District, i.e. Kambala, Nusaulan, and Adijaya villages (Figure 2). The neighbouring villages must have agreed upon an institutional arrangement that governs the communities in utilization of local resources, i.e. coastal ecosystems and fish resources. The aim of the study was conducted to describe existing institutional arrangement that involves leaderships from the three coastal villages in Buruway District, especially in addressing fisheries issues. ~~Such~~ The information is important to the Kaimana MPA managers in developing management strategy for such a vast natural area where stakeholders are scattered across several remote areas while communication and transportation facilities are limited. The aim of the study was to describe existing institutional arrangement in the Sub-MPA Buruway that addresses fisheries issues for sustainable utilization of fisheries resources.

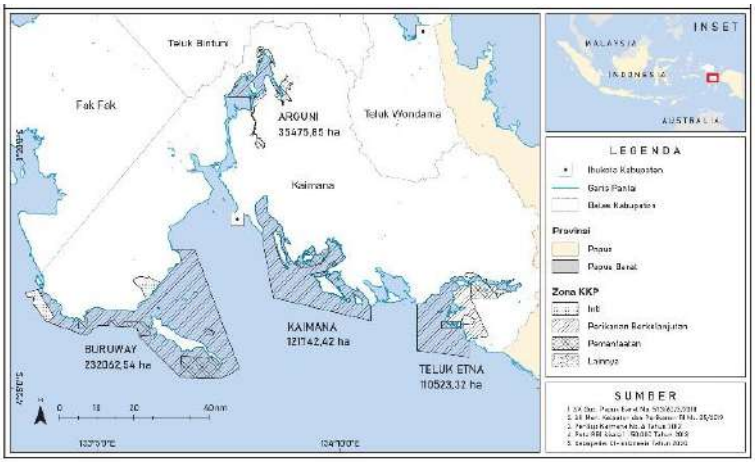

Figure 1. The map of MPA Buruway, Kaimana, Etna Bay, Arguni, and surrounding waters

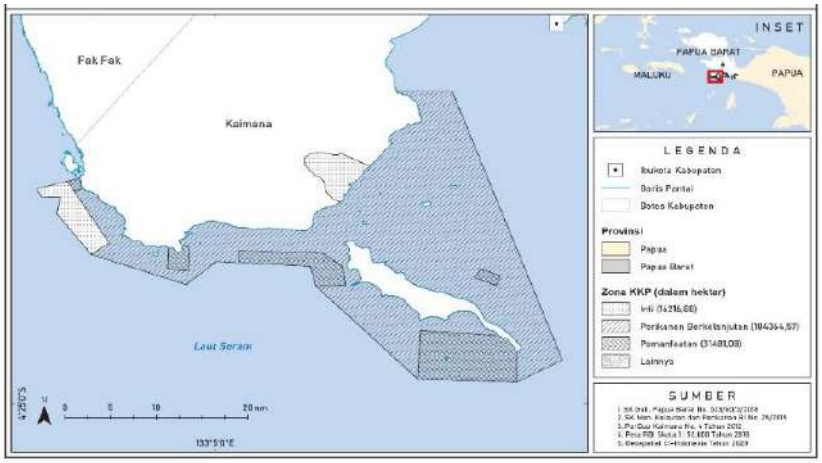

Figure 2. The map of Sub-MPA Buruway

MATERIALS AND METHODS

Conservation International (CI) Indonesia in collaboration with the Environmental Defense Fund (EDF) organized an assessment in the areas from September 2018 to March 2019 to determine the local wisdom of CBFM practices in the Sub-MPA Buruway District Kaimana West Papua Province. The assessment applied Rapid Appraisal for Fisheries Management (RAFM) method (Pido *et al.,* 1996) with modification made by CI Indonesia and EDF (Siahainenia *et al.,* 2018). A survey was carried to collect data and information on the historical transects, fisheries resources characteristics, the trend of fish production, fish size, fishing season, fishing ground, fishing gears, fishing-related problems, and institutional aspect of the fisheries.

The survey was conducted in the three villages of Buruway District, *i.e*., Kambala, Nusaulan, and Adijaya Villages. In addition to the survey, focus group discussions attended by key informants, community leaders and community member representatives were conducted. Secondary data and information were obtained from local fisheries agency and district/village administration offices. Data and information recorded from the FGD and the offices, continued to processed by listing the items of resource ownerships, types of species, and aspects of rights and law. Analysis was carried out to identify similarity and difference in types of fishing right and fisheries resource ownerships, types of fish caught by fishers and types of control on resources use among the three villages.

RESULTS

District of Buruway covers an area of 232,062 ha and about 90% are coastal water areas inside the MPA. Along the 125 km coastline, there are extensive coral reefs, seagrasses, and mangrove ecosystems which are essential fish habitats (Figure 1, Figure 2). Local villagers make their living from marine resources in subsistent way.

In the three villages of Buruway District, *Petuanan* or the leader of the community is the owner of the terrestrial and marine resources. Access and use of the resources in both areas are regulated by unwritten regulation of customary rights reflecting local customs and traditions known as *Sasi*. This traditional management controls the collection period of top shell (*Trochus niloticus*), green turban (*Turbo mamoratus*), and sea cucumber (*Holothuria*). In addition to these three species, the community in Adijaya Village agreed to include abalones (*Haliotis*) and pearl oysters (*Pinctada*) under the control of *Sasi*.

Petuanan has the rights to manage and distribute the ownership of marine resources among the community. Based on rights to control access and use of the fish resources, the Petuanan system recognizes four management groups, namely owners, proprietors, claimants, and users (Table 1). The owners can access and utilize the fishing rights, manage, and regulate the resources, have exclusive right and transfer their rights (Schlager, Ostrom 1992). Meanwhile, the proprietors have the same rights as the owners except, they do not have the right to transfer their ownerships to outsiders. The claimants have the rights to access and utilize and to manage and regulate fisheries resources in the *Petuanan* fisheries area with the owner's permission. Whereas the users only one right, which is the rights to access and utilize the resources. Both claimants and users have to request and pay for the permit for a certain amount that is determined by the owners. The payment can be made in the form of sharing profit system.

Table 1. Fishing rights and fisheries resource ownerships

Fishing Rights	Owners	Proprietors	Claimants	Users
Access and Utilize	x	x	x	x
Manage and Regulate	x	x	x	
Exclusive Rights	x	x		
Transfer	x			

Types of fishing gear operated by fishers in the study are include handlines, bottom lines, gillnets, and other simple gear traditionally used such as harpoons, arrows, and natural poisonous materials. The size of their fishing boats was generally less than 5 GT; they fish mostly inside the

Petuanan area. Local fishing activities are driven by climate patterns: westerly monsoon (December to February) and easterly monsoon season (June to August). The fishers or community members are granted the rights to fish in the customary territory almost all year round, except for the *Sasi*-regulated species. The top ten fish or marine fauna caught or collected by community members in each of the studied villages are presented in Table 2. Sharks appeared to be the most important catch for Nusaulan and Adijaya villagers while tuna (Scombridae) are most important for Kambala villagers. The sharks were caught by handlines and bottom longlines.

The FGD revealed an information from fishers in the three villages on the annual production of sharks from 2014-2018 in which showed an indication of an increased trend, whereas the annual productions of groupers, red snappers and mackerels in the same period fluctuated. The shark production was driven by an increasing demand and the presence of shark fin collectors in Kaimana.

Table 2. Types of fish and other marine fauna caught or collected in the villages and their rank appearance in each of the three coastal villages in Buruway

No	Types of fish or marine faunas	Kambala	Nusaulan	Adijaya
1	Indian mackerels (*Rastrelliger* spp.)	1	10	-
2	Mackerels (*Scomberomorus* sp.)	6	3	2
3	Groper (*Epinephelus* spp)	-	4	4
4	Red snappers (Lutjanidae)	5	5	3
5	John snappers (Lutjanidae)	4	8	-
6	Skipjack tuna (*K. pelamis*)	-	6	-
7	Trevally (*Caranx* spp.)	-	9	-
8	Sea cucumbers (Holothuridae)	3	2	7
9	Various sharks	2	1	1
10	Garfish (Hemiramphidae)	-	7	-
11	Lobsters (Palinuridae)	8	-	-
12	Pearl oysters (*Pinctada*)	9	-	-
13	Tiger shrimps (Penaidae)	10	-	-
14	Other pelagic fish	-	-	6
15	Other demersal fish	-	-	5
16	Top shells (*Trochus niloticus*)	-	-	8
17	Green turban (*Turbo mamoratus*)	-	-	9

Number of clans owning one unit of Petuanan in Buruway District ranged from one clan (a single owner) to a group of clans (multi owner). The marine resources in the *Petuanan* in Kambala and Adijaya villages is owned by two different groups of four clans but that in Nusaulan is owned by a single clan (*i.e*., Samay clan). All villages maintain their customary fishing rights and consider all communities in the three villages in a brotherhood so they can access the marine and fisheries resources in each village's territory with certain conditions (Table 3). The existing customary law distinguishes local fishers from outside fishers; they later must get permission to fish from the resource owners. Among the three villages, only Nusaulan customary law recognizes "large-scale fishers" which are treated differently from other outside fishers, *i.e*. obtaining permit from religious leader.

In terms of fisheries regulation, there is a common similarity among the villages in target species controlled by *Sasi*, closed season and prohibited fishing method, and mesh size of gillnet (Table 4). However, the fisheries regulation in Adijaya Villages appeared to be more comprehensive compared to the two other villages. The target species controlled by *Sasi* are the same among the three villages, however, the *Sasi* in Adijaya also include abalones and pearls oysters. In contrast to the two other villages, capture of lobsters of weight less than 1 kg is prohibited in Adijaya Village. In addition to that, outsiders who stay in Adijaya and work at village and government offices are allowed to catch fish in the Petuanan area.

The fishers in the FGD informed that the local customary law is effective in promoting the sustainability of their target species and ensuring its availability for the next generation. *Sasi* is also

considered helpful to avoid conflicts among marine users since community access and resource utilization of fish resources are managed and regulated. The existing customary fishing rights in the study area also cover: (1) monitoring and surveillance for preventing the fisheries resources from illegal fishing activities, *e.g*., use of destructive fishing gear, (2) establishing the minimum mesh size for gillnets used in the *Petuanan* area (7.5 to 10 cm), *i.e*. ensuring the escapement of small sized fish. This confirmed that the community-based fisheries management was well accepted by the villagers of Buruway District.

Table 3. The customary fishing rights in the three coastal villages in Buruway District

Aspects	Kambala	Nusaulan	Adijaya
Owner	Uriefda, Sadiki, Etana, and Yagana Clans	Samay clan	Singgirau, Laturauw, Sawoka-Safoaraw, and Samay Clans
Owner Rights	Each clan have the right to access, utilize, regulate, manage, and exclusive right;		All clans as proprietors
Right Transfer	The right is not transferable		Clans rights not transferrable but transferrable to the next generation/offsprings
Community Right	Every community member is free to fish in any area, year-round, and all species except *Sasi*-controlled species (*Trochus niloticus*, *Turbo mamorata*, and *Holothuria* sp)	Open access for all Buruway villagers year-round, all species except *Sasi*-controlled species (*Trochus niloticus*, *Turbo mamorata*, and *Holothuria* sp)	All species are allowed to be fished except *Sasi*-controlled species (*Trochus niloticus*, *Turbo mamorata*, and *Holothuria* sp)
Condition of access for local fishers	Fishers from Nusaulan and Adijaya villages are free to fish in Kambala provided a permit notification from the owners	Fishers from Kambala and Adijaya villages are free to fish in Nusaulan provided a permit notification from the owner	Fishers from Kambala and Nusaulan villages are free to fish in Adijaya provided a permit notification from the village government
Condition of access for outside fishers	Outsider fishers must obtain permits from the owners, report their target species, and pay the permits or profit shares.	The large-scale fishers seek permits from local religious leaders Profit share to pay the permits Outsiders fishers directly obtain the permit from the owner.	Outsider fishers must obtain permits from the owners

Table 4. The fisheries customary laws in the three coastal villages in Buruway District

Aspects	Kambala	Nusaulan	Adijaya
Sasi-controlled species	*Trochus niloticus, Turbo mamoratus, Holothuria* sp.	*Trochus niloticus, Turbo mamoratus, Holothuria* sp	*Trochus niloticus, Turbo mamoratus, Holothuria* sp., abalones and pearl oysters
Harvest control	No harvest of *Sasi*-controlled species during closed season	No harvest of *Sasi*-controlled species during closed season	No harvest of *Sasi*-controlled species during closed season
Fishing gear or method	Use of explosive and bomb is prohibited	Use of explosive and bomb is prohibited	Use of explosive and bomb is prohibited
Gillnet mesh size	A minimum of 10 cm for all species, but 5 cm for mackerels (Scombridae)	From 7 to 15 cm	A minimum of 10 cm for all species, but 5 cm for mackerels (Scombridae)
Fish size			Lobster under 1 kg is prohibited
Access for local fishers	Open to village members from Buruway District The rights is automatically transferred from parents to their children	Fishers are allowed to fish in the territory of Kambala and Adijaya village.	-
Access for outside fishers (non- Buruway residents)	Open with permit condition from Petuanan The permit is not transferable	Open with permit condition from Petuanan The permit is not transferable	-

Table 5. (Cont.)

Aspects	Kambala	Nusaulan	Adijaya
Obligation	-	Outside fishers granted the right have to comply with prevailing rules The owners and proprietors agree to maintain fisheries resources for current and future generation	-
Others	Kambala residents who do not live in Buruway maintain the ownership of the rights	The villagers living in Buruway are still entitled to rights to enter and use the regulated *Petuanan* but only as the proprietors (they cannot sell and rent the areas)	Local officers working in the village and district government offices whose origin is not Buruway district can access and fish in the *Petuanan* areas

DISCUSSION

The fisheries in the studied areas can be categorized as subsistent activities but the local communities govern their marine and fisheries resources through unwritten regulation of customary rights and *Sasi*. These unwritten regulations to sustain the environment are aligned with the theory explained by Huppert (2005) who specified that the rights to harvest are closely tied to local social organization and power structure. Both traditional systems can potentially promote effectiveness of conservation of resources for benefiting local people. This also aligned with community-based management purposes when local people are protectors of their marine habitats that critically support community livelihood (Salomon *et al.,* 2011). This effort also as a contribution from the community on the spill over of fish resources around MPA. In Sub-MPA Buruway, the local fisheries regulations are maintained from generation to generation by community leaders that are the owners of the resources at each village. Therefore the success or effectiveness of such regulation depends on how these are enforced by local system. Since, the community leaders are respected and the enforcement of such regulations are supported by not only community members but also by formal local government officials at village level, the local community leaders can contribute to promote the effectiveness of MPA management.

Active involvement of the local community in determining important regulations are the main key success factors in the implementation of a sustainable fisheries management plan. The involvement could enhance understanding and firm commitment of the villagers on the distribution of the resource's ownership, a key success on CBFM (Poemeroy, 1994). A community-based resource management began from the premise that people have the innate capacity to improve their quality of life. It aligns with the rights that have been identified by Schlager & Ostrom (1992).

The control of access to fish the resources in coastal waters adjacent to the three villages by community leaders in Buruway District may be considered traditional system of fishing permit. In these coastal waters, fishing pressure on the resources is determined by the amount of fishing permit granted to local community members and fishers from outside. Therefore, the MPA managers should carefully consider the implication of traditional permit system in developing fishing permit system for the entire MPA. On one hand, the MPA managers need to inform the leaders some consequences of increasing fishing pressure on the fisheries resources. On the other hand, the MPA managers must prepare estimates of maximum limit or total allowable catch per fishing period. If the local leaders understand the principle of sustainable fisheries concept, they will be able to make the right decision that is less threatening to the sustainability of the resources.

The information provided in this study may be considered by Kaimana MPA managers at least for two purposes. The first reason is in designing engagement of community members in MPA programs or activities, such as economic development, MPA surveillance, fisheries data monitoring etc. through community leaders with their customary laws. The second reason is in designing capacity building program to empower traditional practice in fisheries management.

CONCLUSION

The existing customary laws in the three villages of Sub-MPA Buruway is manifested in *Petuanan* that is a territorial rights system. The system defines several different functional roles in the community and governs the subsistent utilization of marine resources in Buruway. These customary laws are strategic in helping the management body of the Kaimana MPA, especially in controlling access to local resources and promoting community engagement. However, technical assistance is needed to improve local leader capacity,

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APPRECIATION

The First Capture Fisheries International Symposium hosted by:

1. Department of Fisheries Resources Utlilzation Faculty of Fisheries and Marine Sciences, IPB University (http://psp.fpik.ipb.ac.id)
2. Forum Komunikasi Kemitraan Perikanan Tangkap (FK2PT)

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1. Fakultas Perikanan dan Ilmu Kelautan, IPB University (http://fpik.ipb.ac.id)
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At a glance about the Hosts of the Symposium

Department of Fisheries Resources Utilization - Faculty of Fisheries and Marine Sciences, IPB University

Department of Fisheries Resource Utilization - FPIK IPB University, historically started from the Section of Marine Fisheries, Faculty of Veterinary Medicine, University of Indonesia in 1960. After IPB University was established on its own in 1963, the Section of Marine Fisheries became part of the Faculty of Fisheries. In its development, the Department of Marine Fisheries has changed its name several times, until it finally became the Department of Fisheries Resource Utilization (PSP) since 2005.

This department has the mandate to develop science, technology, management, and policy of capture fisheries. It covers various disciplines, including textile technology, hydrodynamics, mechanical engineering, shipping architecture, electronics and electricity, fisheries biology, oceanography, hydroaccoustic, meteorology, fish handling and processing technology, supply chain management, port management and system, legal and fisheries policy, and fisheries economy.

Department of Fisheries Resources Utilization has more than thirty staffs, which 80% of them hold a Ph.D. degree from Indonesia, as well as abroad (France, Germany, British, Australia, and Japan). The department has five working divisions: fishing technology, fishing gear technology, system and fisheries policy, fishing port system and management, and fishing vessels and maritime transportation. At present, the Department manages three study programs, namely the Capture Fisheries Technology and Management Study for the Undergraduate program, and the Marine Fisheries Technology Study for Master and Doctoral program. All programs are accredited by the National Higher Education Certification Agency (BAN-PT). Lecturers and students always do scientific development that produces innovative works. Some innovations that have been created and recognized at the institutional and national level are the Fish and Bone Separator Machine, Squid Attractor, Portable FADs and others.

More information can be accessed at http://psp.fpik.ipb.ac.id

At a glance about

The Capture Fisheries Partnership Communication Forum (FK2PT)

The Capture Fisheries Partnership Communication Forum is an organization initiated by the Department of Fisheries Resources Utilization (FRU) - Faculty of Fisheries and Marine Sciences - IPB University to accommodate interaction among academics, industries and government institutions concerned with capture fisheries issues. To realize the formation of the forum, Department of FRU conducted an assessment of fisheries stakeholders from the academia, industries and government. On Monday, October 16th 2006 at IPB Baranangsiang Campus, a communication forum was declared and named the Capture Fisheries Partnership Communication Forum (Forum Komunikasi Kemitraan Perikanan Tangkap, FK2PT). The objective of establishing FK2PT is to contribute thoughts and progressing the process in implementing sustainable capture fisheries and improving the competitiveness of national fisheries industries to the legislative and executive bodies, universities, industries and other formal institutions and individuals who are eager in progressing the capture fisheries. Later, the constitution of the Forum (Anggaran Dasar and Anggaran Rumah Tangga) was developed and established.

The Forum achieve its objective by conducting various formats of communication to provide advice and implement process by:

(1) Encouraging the creation of conducive business climate and increasing business productivity;
(2) Supporting the creation of controlled utilization and development of human resources and capture fisheries science and technology;
(3) Providing inputs for fisheries policy development.

Forum membership is open to individuals or institutions who are interested in developing capture fisheries and are willing to participate in implementing the objectives of the Forum.

FK2PT Workplan for 2017-2020

Human Resources Development and Research Commission:

(1) Study on special topics through discussion of research results related to issues of fisheries management, business performance, and conservation of fish resources.
(2) Organize seminars or FGDs to produce FK2PT positioning document on selected issues.
(3) Develop competency standards for alumni of Fisheries Resources Utiliazation undergraduate study programs (2018-2019).

Public Relations, Journal, and Publications Commission:

(1) Organize Fisherman Partners, a consultation center for fishermen.
(2) Manage and coordinate scientific journals under the auspices of FK2PT.
(3) Publish the FK2PT activities in print and electronic media.
(4) Hold scientific seminars for disseminating the results of studies conducted by FK2PT members.

Economic, Business, and Partnership Commission:

(1) Organize Fishing Industry Expo
(2) Organize Capture Fisheries Policy Discussion
(3) Organize Business Coaching Clinic

Some of the activities that have been conducted by the Forum:

(1) Regular publications of scientific journal "Journal of Marine Fisheries."
(2) Participation in the discussion of Technical Guidelines and Survey Forms for Monitoring Activities Performance of Fishing Equipment Assistance, March 29th, 2018.
(3) Participation in providing input to the Draft Government Regulation of the Republic of Indonesia concerning the Placement and Protection of Crews of Indonesian Migrant Fishing Vessels, on September 27th, 2018.
(4) Participation in the "Discussion of Action Plans for Implementation of STCW-F" in Bogor, on February 9th, 2019