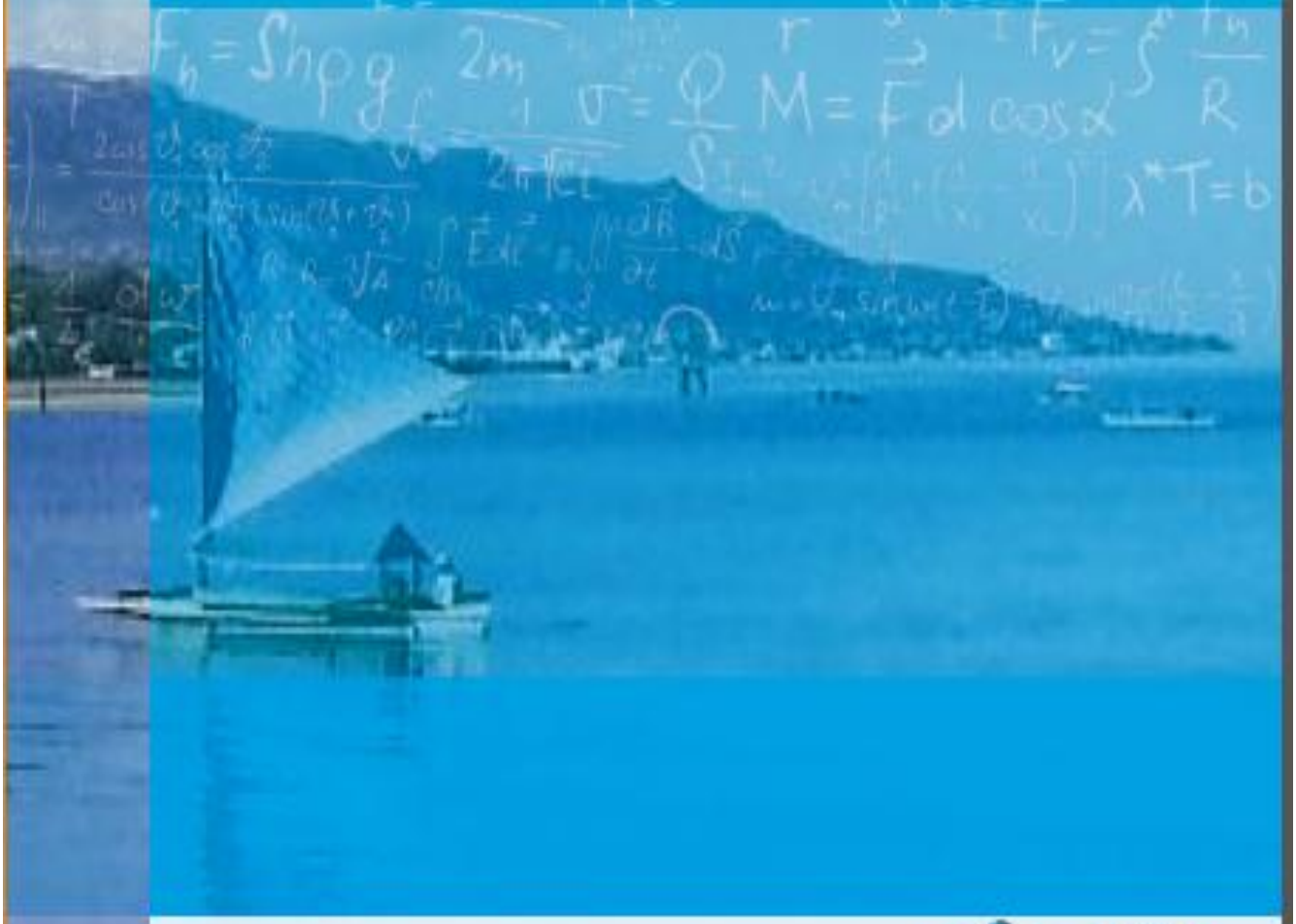
Basic Science
for Sustainable Marine Development

PROCEEDING
INTERNATIONAL SEMINAR 2015

Ambon, 3-4 June 2015



Organized by
Faculty of Mathematics and Natural Sciences
Pattimura University

PROCEEDINGS

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Welcoming Address by The Organizing Committee

The honorable, the rector of Pattimura University

The honorable, the vice rector of academic affair, Pattimura University

The honorable, the vice rector of administration and financial affair, Pattimura University

The honorable, the vice rector of planning, cooperation and information affair, Pattimura University

The honorable, all the deans in Pattimura University

The honorable, the key note speakers and other guests.

We have to thank The Almighty God for the blessings that allow this International seminar can be held today. This is the first seminar about MIPA Science in which the Faculty of MIPA Pattimura University becomes the host. The seminar under the title Basic Science for Sustainable Marine Development will be carried out on 3 June 2015 at Rectorate Building, the second floor. There are 250 participants from lecturers, research institute, students, and also there are 34 papers will be presented.

This International seminar is supported by the amazing people who always give financial as well as moral supports. My special thanks refer to the rector of Pattimura University, Prof. Dr. Thomas Pentury, M.Si, and the Dean of MIPA Faculty, Prof. Dr. Pieter Kakissina, M. Si. I also would like to express my deepest gratitude to Dr. Kotaro Ichikawa, the director of CSEAS Kyoto University, Prof. Bohari M. Yamin, University of Kebangsaan Malaysia, Prof. Dr. Budi Nurani Ruchjana (Prisident of Indonesian Mathematical Society/Indo-MS), Dr. Ir. A. Syailatua, M.Sc (Director of LIPI Ambon), and Hendry Ishak Elim, PhD as the key note speakers. We expect that this international seminar can give valuable information and contribution especially in developing basic science for sustainable marine development in the future.

Last but not least, we realize that as human we have weaknesses in holding this seminar, but personally I believe that there are pearls behind this seminar. Thank you very much.

Chairman

Dr. Netty Siahaya, M.Si.

Opening Remarks
By Dean of Mathematic and Natural Science Faculty

I express my deepest gratitude to The Almighty God for every single blessing He provides us especially in the process of holding the seminar until publishing the proceeding of International Seminar in celebrating the 17th anniversary of MIPA Faculty, Pattimura University. The theme of the anniversary is under the title Basic Science for Sustainable Marine Development. The reason of choosing this theme is that Maluku is one of five areas in Techno Park Marine in Indonesia. Furthermore, it is expected that this development can be means where the process of innovation, it is the conversion of science and technology into economic value can be worthwhile for public welfare especially coastal communities.

Having the second big variety of biological resources in the world, Indonesia is rich of its marine flora and fauna. These potential resources can be treated as high value products that demand by international market. Basic science of MIPA plays important role in developing the management of sustainable marine biological resources.

The scientific articles in this proceeding are the results of research and they are analyzed scientifically. It is expected that this proceeding can be valuable information in terms of developing science and technology for public welfare, especially people in Maluku.

My special thanks refer to all researchers and reviewers for your brilliant ideas in completing and publishing this proceeding. I also would like to express my gratefulness to the dies committee-anniversary of MIPA Faculty for your creativity and hard working in finishing this proceeding, God Bless you all.

Dean of Mathematic and Natural Science Faculty

Prof. Dr. Pieter Kakisina, M.Si.

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The Importance of Basic Science for Sustainable Marine Development in Indonesia

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ABSTRACT

Indonesia is very well known as one tropical state in the faunistic centre according to Ekman's concept (Ekman, 1953). This circumstance has attracted scientists and naturalists from all over the world to conduct expeditions and observations on marine fauna and flora in these waters, long before the Indonesian state was declared, such as Rumphius (1627-1702), Bleeker (1819-1878), Challenger (1872-1876), Siboga (1899-1900), and Snellius I (1921-1930). Therefore, the Indonesian archipelago has long been recognized as one of the world's biodiversity hotspots. In addition, marine resources also play a significant role for Indonesia's economic growth. Besides their utilization as a national food supply, several/many Indonesian exports are marine products, like fishes, prawns, seaweeds, and sea cucumbers. Moreover, Indonesia has exploited off-shore oil and natural gas since the 1970's. Thus, exploitation of marine resources in Indonesia is in high demand for domestic and international markets. To sustain the marine resources and development, we need data and information taken from marine research, especially deep sea research. For the coming years, Indonesia will have to do more deep sea research to understand the marine biology, physics, chemistry, and geology aspects. Other issues of concerning marine research include climate change.

Marine Development in Indonesia

Indonesia is the largest archipelago state in the world dominated by 70% seawater of its entire territory. It means that this state or country might have a vast marine resources including living marine resources, like fishes, plankton, seaweed, etc. as well as non-living marine resources, such as, oil and gas, minerals, sea current, and so on. Besides that, maritime services are also built significantly. Therefore, Indonesia is well known as a country with abundance in marine resources (Hutomo & Moosa, 2005).

To sustain the marine resources, Indonesia was established several strategies. For example, in capture fishery, there are 11 fishery management zones; for marine conservation, there are 12 priority target areas. Also, for oil, gas and mineral exploitations, Indonesia has a map indicating the area as a producing basin, drilled basin, proven discovery, and frontier basin (Kementerian PPN/BAPPENAS, 2014). Thus, the strategies for sustainable marine resources in Indonesia were already initiated, however in some cases, we still face inconsistently in practice.

For some reasons, marine development is a very essential for Indonesia; (1) to strengthen food security; (2) to enhance economic growth, including energy (fossil,

renewable, etc.), maritime services, sea transport, and marine tourism; and (3) to understand marine science, including basic science.

Science for Marine Development

Marine studies in Indonesia had already taken prior Indonesia declared its independent in August 1945. During the 17th - 19th centuries, about 33 marine expeditions had conducted in Indonesian waters, and they came from several countries, such as France, British, Dutch, Austria, Germany and US (Nontji, 2009). Every expedition was focused on particular aspects depending on the purposed marine study, and contributed significantly data and information on marine resources of Indonesia. Some of expeditions were well recognized in marine science world wide, such as as Rumphius (1627-1702), Bleeker (1819-1878), Challenger (1872-1876), Siboga (1899-1900), and Snellius I (1921-1930). Since then, we understood that (marine) science has developed in Indonesia.

After 1945, more marine expeditions had done in Indonesian waters either by Indonesian or foreign scientist(s) (Nontji, 2009). Some of them also provided more data and information related to marine resources, such as Galathea (1950-1952), Baruna I (1964), Baruna II (1976), Rumphius I (1973), Rumphius II (1975), Alpha Helix I (1975), Rumphius III (1977), Alpha Helix II (1979), Rumphius IV (1980), Coridon (1981), and Snellius II (1984-1985). Moreover, in the 1990's, we observed the giant current as called as "Indonesia Through Flow" from the Pacific Ocean to Indian Ocean. This study was taken in eastern Indonesia waters. We also discovered the living fossil fish (coelacanth) in north Sulawesi in 1997 (Syahailatua, 2011), and seamount "Baruna Komba" in south Banda Sea in 2003. All findings from the previous marine expeditions or observation or studies could enhance our knowledge on marine resources and environment.

The marine science is developed from time to time. After several expeditions taken, we then established marine conservation program. For example, in 1998, we established the Coral Reef Rehabilitation and Management Program (COREMAP) that purposed to sustain coral reef ecosystem in Indonesia (www.coremap.or.id). Based on this program, and then together with 5 other countries (PNG, Timor Leste, The Philippines, Malaysia, and Solomon Island), we declared Coral Triangle Initiative (CTI) in the World Ocean Conference 2009 (www.coraltriangleinitiative.org). Thus, marine science covers a huge range of programs and activities, from expeditions to conservations.

Basic Science in Marine Research

Research in marine resources and environment is always related to basic science (physic, chemistry, and biology), and other extended science, such as microbiology and geology. Almost all previous expeditions or studies on marine science in Indonesia were very much based on basic science. For example, Rumphius (1627-1702) worked on taxonomy of fauna and flora, including marine biota; Challenger Expedition (1874-1876) focused on physical oceanography with temperature measurement into the deep of seawater; Siboga Expedition (1989-1990) collected about 555 species of marine algae; Galathea Expedition (1950-1952) studied on biology of deep sea, and Alpha Helix Expedition (1975 & 1979) researched on Bioluminescence of marine fishes (Nontji, 2009). It means that basic science play a significant role in marine science development.

The Future of Basic Science

Science and technology have been much developed for the last 30 years, and they also influence progress in basic science. Experiments in basic science could be conducted with sophisticated research instruments in the field as well as at the laboratory. For example, in the past, to measure the water temperature, a reversing thermometer was used, however nowadays, the CTD (Conductivity, Temperature and Depth) instrument is applied. Changes in technology determines basic science approaches to be more simple, faster and more accurate.

Basis science is very important in marine development, because without basic science, other sectors including marine sectors are not well developed. Therefore, we have to improve our basic science with suitable concept and strategies, including human resources development, facility or infrastructure (e.g labs, equipment) improvement; establishment of (basic) science priority or focus to support marine development; and enhancement in research networking at several levels (local, national, regional or international). So, basic science is needed to enhance marine resources. And then, marine resources could be applied to strengthen food security and to enhance economic growth for better life, national security and sovereignty.

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