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# Investigation of Fisheries Resources Through Digital Fisheries Applications Towards a Culture Community in the Revolution 5.0

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***Abstract---****Investigating marine resources through the application of technology today is a critical issue to be developed towards a technology-based 21st-century fishing society. We obtained the data from publications from 2010 to 2022. Then we examined the phenomenological approach, which involved an in-depth evaluation data coding system and high interpretation in obtaining data with high validity to answer the problems and hypotheses. After a series of studies and discussion of the results, we can conclude that investigations of marine resources using technological applications have resulted in several applications, including the track fish application, the Nusantara sea application, the intelligent fishermen application, Nusantara fishermen, Wakatobi Ais, and then I long books application. This is useful for the development of similar studies in the future.*
***Keywords---****fish resources, fisheries applications, investigations, marine, technological culture community*.

## Introduction

The fishing system has become an issue that has never been discussed in various countries today. This research investigates fisheries resources through digital fisheries applications in Indonesia and concludes that fisheries management in Indonesia is more complex and challenging than in many countries. It then describes the history of Archipelago fisheries management and the process of developing Indonesian fisheries policies, highlighting the significance of fisheries policies in directing and driving the outcomes of the fishing sector across the seas. We studied and assessed the critical systems and measurements of Indonesian fisheries management (Klemas, 2013; Ducharme-Barth et al., 2022; McGarvey et al., 2010). Over the last few decades, Indonesia has progressively established advanced fisheries management systems, particularly following the reform and opening up, which have been critical in ensuring the success of the catch fisheries industry. Many attempts have been undertaken to repair fisheries' natural environments, and the ability for law-based fisheries governance has considerably expanded. However, due to the features of Indonesian fisheries and the complex and unpredictable nature of fisheries, some significant challenges still need to be overcome in their capture fisheries. The analysis ends, with the relevant fishing technological application development strategy, with Indonesia's prospects and capabilities in fishing for the prosperity of the community, especially fishermen (Baran & Hambrey, 1999; Cooke & Cowx, 2006; Stewart, 1994).

This kind of study is very urgent to be carried out considering the gap in fishing between traditional fishermen and modern fishermen, especially catch management and catch management and problems related to technological transformation for all fields of activity (Linke et al., 2020). However, through a review of various activities, helping fishermen in Indonesia requires parties at all levels to disseminate information related to scientific evidence that supports businesses where fishermen focus is how to get application features to catch fish in Indonesian waters (Bennett et al., 2020). After this study, to manage fisheries, it returns to the past where after an evaluation related to the fishing mechanism, this study provides advantages on how technology can manage the continuation of fishing,

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which is one of the community's economic resources and efforts to improve the national economy (Islam et al., 2021).

An explanation of the findings becomes practical material for how the fishing community implements a technology control system where technology-based governance for fishing participates in preserving which areas and which fish cannot be caught and which must be kept. With the identification of various full ranges that can be applied in the world of fishing by fishermen, it is felt necessary that various studies in fishing fisheries governance are supported by a variety of very comprehensive literature based on international reports such as the world marine federation combined with laws and regulations in Indonesia regarding fishing, publications that raise issues of system identification and application of technology that support the assessment are highly desirable (Mrówczyńska et al., 2021).

The Community for the Review and Design of Marine and Fisheries Innovation (CRDMFI). The Service of Oceanic Undertakings and Fisheries has aided in developing an electronic fishing logbook innovation based on CRDMFI (de Freitas et al., 2017). The electronic fishing log book, or simply "e-log book," according to Cooke et al. (2013), is a piece of technology primarily used for electronically inputting fish capture data. The electronic hardware log book for fish machines developed in 2013 can be found in. The electronic hardware logbook uses a touch screen to input and display data. The electronic logbook's data features and formats adhere to the government Regulation. According to Cooke et al. (2013), the Republic of Indonesia's 2010 Law No. 18/MEN/2010 on the Fishing Log Book mandates that fishermen record information about their vessels, gear, operations, and fish catches in an electronic log book. This tool has features and application menus supporting fishing activities and data. These features and application menus include information on emergency conditions, weather, coordinates on the Predicted Fishing Area Map (PPDPI), fish price information, sea surface temperature information, and vessel track records (Thiault et al., 2017).

The electronic logbook generally works this way: on a boat, the fisherman or ship's captain enters fish catch data into the electronic logbook. This tool has a vessel track record feature and fish catch data (Otterå et al., 2023). The ship's track record data can be set automatically every hour so that the ship's movement from departure to return to the port can be known. The GPRS (General Packet Radio Service) network will send all the data to the web server. The data will be saved in the data logger (data logger) if there is no GPRS signal. According to Kovacs et al. (2014), once the GPRS signal is received, the data recorder will automatically transmit all of the data to the web server. A web-based information system is required to transform electronic logbook data into statistical information in real-time. A computer system that processes data to produce information is known as an information system (Tondewad, 2018). This system has communication tools to exchange data or information with other equipment. As a result, a web-based information system leverages web or internet technologies to give information and services to users or other data management. An internet system is often made up of one or more web applications, each of which serves a clear function. According to Kovacs et al. (2014), the overall function of a web-based information system is defined by how well each of these components interacts with one another.

In 2011, P3TKP developed the log book electronic information system as a web-based application. However, user authentication is not included in the web-based application's security or user access rights. Users include ship owners, fishing ports, and fisheries authorities who are interested in the data in the electronic logbook. Only periodic table features and catch tables for viewing fish catches are included in the web-based application. In 2011, the web-based electronic log book information system did not provide fishermen with significant weather, fish prices, and maps of estimated fishing areas they needed. A web-based information system must meet several requirements. The first requirement is a capable web server to support the information system (Gibbs, 2004; Darmadi et al., 2017; Ermayanti et al., 2016).

The Apache Web Server is currently the most widely used. Something else that is an outright necessity is web programming. There should be a web programming language as an ally to HTML. PHP is one of the well-known ones. Another significant thing is a solid information base for storing and overseeing information. The utilized database must handle millions of records and be accessed quickly. Oracle is one of the databases that should be used because of its high level of dependability. On the other hand, MySQL can be used for databases that are not too big (Rautmare & Bhalerao, 2016). The information in a fishing log book is private. The fisheries law ensures this secrecy on behalf of the government (Republic of Indonesia, 2009). This research aimed to figure out how to create a web-based electronic fishing information system. It is hoped that it will make it easier for fishermen and other interested parties to obtain fishing data to manage fishery resources sustainably and profitably in the 5.0 revolution era in the archipelago.

## Research Method

In this section, we explain that this study aims to investigate marine resources with digital fisheries applications towards the 5.0 revolution era of a technologically cultured society. Our data search was conducted on several government regulatory fisheries literature and applications supporting marine and fishermen (Mion et al., 2015). Our data is designed in descriptive qualitative through a phenomenological approach which involves several technical data stressing, analysis, evaluation, interpretation, and drawing of results on the validity and reliability of findings. This study emphasizes secondary publication data from releases from 2010 to 2022, considering recent developments in marine technology. This has received very significant growth. Become a reference for the parties, especially in maritime policy-making and academic projects (Zhang et al., 2000; Blanco et al., 2007; Lloret et al., 2008).

## Result and Discussion

In this section, we will present the results of a review of several published journals and books. The aim is to report the results of an investigation of marine resources with the application of technology to increase fishing power for fishing communities living in an era of technological culture. We present these results and are supported by Scientific sense in the form of previous studies that we report in qualitative data where we want to get a proper understanding of what we have been able to inform the reader (Trionawan et al., 2021).

### *TREKFish*

The TREKFish tool was created for tracing and tracking fishing traces (Natsir et al., 2022). Turkish is the name of the technology device. A tool for tracking trail fishing is TREKFish. Whether it is pelagic fish, lobsters, crabs, or another species, the developed system can be detected during setting and hauling and is designed to record the ship's journey. The Marine Instrumentation & Robotics Laboratory at FPIK IPB, Department of Marine Science and Technology, developed TREKFish, and the fishER Fisheries Electronic Reporting software is included with the tool. This device is appropriate for the limited scope and modern fisheries. Tracing fishing operations (transit time and operations) and distribution maps of the primary catch are among the data and information gathered (Barus et al., 2019). Additionally, bycatch and catch per effort unit. This device has a battery, solar panels, waterproof casing, and GPS specifications. A satellite is not required to use this equipment. Turkish is a fisheries-related technological innovation developed by IPB University researchers from the Faculty of Fisheries and Marine Sciences.

Fish, crabs, lobsters, and other fishing traces can be mapped using this technology. The T TERTMfish software with TREKFish works with electronic fishery reporting (Natsir et al., 2022). The TREKFish innovation advancement group comprises Indra Jaya, Hawis Madduppa, and Muhammad Iqbal. They saw much demand for crab meat products, which made crab fishing more intense. This makes the crab populace overfished and in essential condition. Likewise, different issues that compromise the manageability of the blue swimming crab are fishing exercises that harm the climate and the lopsided circulation of fishing regions. Eventually, these issues led to the development of the TREKFish technology (Rogerson, 2015). According to Hawis, this instrument is suitable for industrial and small-scale fisheries. Even TREKFish was created with the Seafood Import Monitoring Program in mind. "Hawin," quoted on the IPB website, stated, "is designed with the IoT concept by utilizing microcontroller and GPS technology, so that software can be monitored in real-time, wherever and whenever, "Hawis explained that crab fishing in Indonesia, especially for the type of Portunus pelagicus, has utilized TREKFish technology TREKFish (Salter-Jansen, 2011).

This technology is also constantly being improved to make it easier for small-scale fishermen to use. Regarding its application, fishing boats have installed the TREKFish Vessel Tracking System (VTS). VTS will be able to show you where to fish for crabs (Hanh & Boonstra, 2019). In the meantime, the Indonesian Blue-Swimming Crab Association (APRI) and PANRITA, the company that makes the technology for this tool, are working together to put TREKFish VTS tools on fishing boats. 15 TREKFish VTS units will have been installed in Indonesian crab fishing areas as of October 10, 2021. Pamekasan Regency in East Java, Pangkep Regency in South Sulawesi, and Rembang Regency in Central Java, among others, are some examples. The establishment of these units was done fully intent on getting complete information regarding the restocking framework to nature and satisfying the signs of the Fisheries Improvement Task. Superman, a Sumenep fisherman who frequently uses the VTS TREKFish technology, stated that the presence of this technology is highly beneficial to the local crab fishermen (Rogerson, 2015).

This tool provides information on fishermen's fishing lines and can also be used to obtain information on the location of fishing gear scattered in the sea. TREKfish is a technology for tracking fishing traces (Tolley & Hall-

Arber, 2015). This technology aims to trace fishing traces, such as crabs, lobsters, and others. This tool is also equipped with fishER software (catch reporting system, Fisheries Electronic Reporting). According to (Alós et al., 2022), this tool is suitable for small-scale and industrial fisheries. It is designed and developed to support programs tracing the origin of caught fish and SIM (Seafood Import Monitoring) (Urquhart & Acott, 2013). TREKfish also does not require a satellite communication network to carry out the tracking function of fishing operations.

*Laut Nusantara*

The Marine Research and Observation Center – Marine Research Center, Maritime and Fisheries Research and HR Agency, and PT XL Axiata Tbk (XL Axiata) worked together to create this application (Franz et al., 2021). Over a thousand Indonesian fishermen have been taught how to use these tools. The Laut Nusantara application, recently called "mFish" was worked for roughly five months. This electronic system stores information about fishing, such as the distance to locations, the amount of fuel used, the number of catches, the kinds of fish caught, the prices of fish at ports, and contact information. Laut Nusantara is based on an android system for small fishermen with boats weighing less than 30 gallons of water. To access information from all of Indonesia, applications can be downloaded for free from the app store and installed on mobile phones. The launch of this application occurred on August 30, 2018. The Laut Nusantara application stands out from MFish due to its more extensive real-time information base (Bailey et al., 2016). Laut Nusantara is a new fishing technology innovation in the form of an Android app. The government is now developing the application through the Maritime and Fisheries Research and Human Resources Agency, which will improve the benefits for Indonesian fishermen. Through the innovation of technology, the presence of this application is intended to propel fishermen's culture from "looking for fish" to "catching fish." When working at sea, fishermen can better plan their fishing activities, independently determine the closest fishing location, estimate fuel requirements, and estimate selling prices with just one hand on the application (Tebaiy et al., 2020). This combines data from satellites. This is real-time because we combine all observation and modeling data; we update the data every day. In addition, we combine it with a variety of conveniences. At the moment, there is a new development in the form of a feature that can display three kinds of fish that have a high value to the economy: albacore, bluefin, and yellowfin tunas. In the past, applications were made in the Nusantara Sea (Zhang et al., 2021).

This feature allows users to converse with one another. The Laut Nusantara application provides data-based information to boost work productivity and educational information about potential and other marine issues (Ramadhan, 2021). This data and information incorporate, in addition to other things, the presence of coral reefs, the conservation of marine life, and the danger of contamination. XL Axiata also organizes Sisternet program classes for women from fishing communities in Perancak Village, Jembrana, to complement its efforts to educate fishing communities about how to use digital technology. To increase women's participation in the family economy and the environment, the Sisternet class will provide education on digital technology and the internet. In this class, fishermen's wives will learn critical marketing strategies for the internet and social media (Ginting & Putra, 2020).

XL Axiata hopes that by taking this class, the wives of fishermen will have a better understanding of the benefits of internet technology, the digital economy, and the economic potential of their villages, which can be developed through the use of digital/internet technology, particularly in marketing or promotion (Donnelly, 2018). This program will run for one day, and it is hoped that participants will be able to use it in their daily lives after attending this class. The government is under the marine research and observation institute. It has complete marine data and is very helpful for developing the marine sector, including the benefits that small fishermen can get from it. The title of this article can be found on Tribun-Bali.com. Let us learn more about the Laut Nusantara software; what functions do they serve? (Donnelly, 2018).

*Nelayan Pintar*

This mechanical gadget was created by the Oceanic Innovation Designing Studio (LPTK) of the Marine and Fisheries HR Exploration Organization, along with the Service of Correspondence and Informatics. The goal of the go-online fishermen program, also known as Smart Fishermen (Nepean), is to meet the various requirements of fishermen (Susilowati et al., 2020). Such as the weather, port conditions, wave size, wind direction, and prices in the fish market. Fishermen can compare the price of fish in each region. There is an SOS that allows fishermen to communicate with the closest fishermen in an emergency, such as running out of fuel. The middleman market chain can be broken through this application. This application provides market information via the Fishing Area Map system, including a list of fish prices that the Smart Fisherman application only targets small fishermen with 10 GT fishing boats. Indonesia is wealthy in marine assets, particularly fisheries; however, until this point, numerous

anglers have not been ideal in their fishing exercises (Muawanah et al., 2017). Because fishermen are the Ministry of Maritime Affairs and Fisheries (MMAF)'s primary stakeholders in the fisheries sector, they must have easy access to appropriate technology to aid in fishing. The Marine and Human Resources Agency launched innovations derived from marine and fisheries research that are extremely helpful in the fishing process to support the three pillars of KKP policy and its commitment to the welfare of Indonesian fishermen. The Smart Fisherman Information System, or Nelpin, is the name of this technology (Serafy et al., 2012).

The Nelpin app will allow fishermen to shift their focus from looking for fish in the sea to catching fish. It is anticipated that the Nelpin application will serve as a tool for assisting in the determination of fishing grounds in fishing activities (Wiyono et al., 2018). Naturally, this will affect fishermen's income because, with a known fishing location, fishermen will not have to waste fuel searching for locations, and fishing activities will also be more environmentally friendly. For your information, the government has been working on the Android smartphone application Nelpin since 2015 to assist fishermen in fishing endeavors. The Estimated Fishing Area Map, water fertility, weather information, the most recent fish price information, fuel forecast features, and assistance are all included in this application, a combination of several Android-based information applications. This modification is tailored to fishermen's requirements (Palalloi & Anwar, 2018).

*Nelayan Nusantara*

This website is a forum for us crab fishermen to share information and experiences related to our commitment to play a fundamental role in helping the Indonesian government sustainably manage crab fisheries in Indonesia (Ramadhan, 2021). Starting from our concern as fishermen for crab resources which are the primary source of livelihood, it is increasingly challenging to get crab catches to meet our daily needs. Traditional fishermen, including, in this case, us crab fishermen, have the characteristics of dependence on natural conditions and the catch they get (Ksatrya, 2019). In addition, dependence also occurs on aspects of capital and marketing social networks. By working together as a unit, crab fishermen can significantly contribute to sustainable and just crab fisheries management (Leschen & Correia, 2010).

The Nusantara Fisheries digital APP has been implemented in three regions in Indonesia, namely Sebatik in Nunukan Regency, North Kalimantan, Paguyaman Pantai in Boalemo Regency, Gorontalo Province, and Natuna in the Riau Archipelago (Ksatrya, 2019). This Android system-based device uses the Telkomsel network. The Archipelago Fisherman application is the government's commitment to supporting the fisheries sector's development. The project cooperates with PT Zetta Media Inspira (Zetmi) as the maker of the Nusantara Fisherman Nusantara application to support fishing activities for small fishermen with vessels under 10 GT. This application displays, among other things, fishing zones and information on weather conditions such as waves and wind speed. Then, avoid accidents at sea, photos, and catches, as well as information on fish prices for small fishermen and the wider community (Huchim-Lara et al., 2016).

*Wakatobi AIS*

The fishermen's safety is the goal of this beach radar device. Fishermen can utilize this technology for maritime safety with shore radar. Wakatobi AIS, which stands for AIS (Automatic Identification System) Information-Based Object Monitoring and Safety Forum, is the name of this technology (Agus et al., 2018). The essential AIS function enables the receiving station (Vessel Traffic System/VTS) to monitor fishermen's locations and movements continuously. Engineers and researchers at the Wakatobi Marine Technology Engineering Workshop (LPTK) developed this technology. Based on the identification of three primary issues that seafarers face, Wakatobi AIS was developed. The AIS transponder is a box that measures 14.5 by 13 by 20 centimeters. The antenna has a length of one hundred centimeters. Because each unit weighs 0.6 kilograms, it can be used on small fishing boats and vessels, especially fleets weighing less than 1 GT (Gross Ton). This tool is intended to be portable with a battery that can be recharged every 20 hours. Recording the users' locations will make it simpler to locate them if they encounter a problem at sea, such as a sinking, a dead ship engine, or a robbery. Additionally, fishermen can actively communicate emergency information to other AIS-capable devices (Widyanto et al., 2017).

When visiting the Wakatobi Marine Technology Engineers Workshop, the Minister of Maritime Affairs and Fisheries, Sakti Wahyu Trenggono, observed the operation of technology equipment directly. Minister Trenggono also acknowledged the Wakatobi AIS technology's contribution to enhancing sailing safety, particularly for small fishermen (Aripin et al., 2020). This is excellent; however, it must be improved to better meet the requirements of sailors' fishermen through its features and messages. On this particular day, Minister Trenggono also symbolically

presented fishermen with ten units of Wakatobi AIS assistance and the Wakatobi District Government with one unit. He hoped the Wakatobi fishermen's productivity would rise due to the assistance provided (Asis et al., 2016).

Naturally, we hope this device and technology will help fishermen become more productive, thereby increasing their wealth. Additionally, this is beneficial for efforts to accelerate measurable fishing. Meanwhile, Silva et al. (2022), speaking on behalf of their experts, explained that the primary function of the Wakatobi AIS technology is to monitor fishermen and various aspects of fishermen's safety. Rudi stated that AIS is anticipated to solve small fishermen's issues, such as the availability of meteorological data in fishing areas, monitoring, and shipboard emergencies. With this gadget, it is trusted that the boat can be checked so that help can be done rapidly when a crisis happens (Tolley & Hall-Arber, 2015).

Navarrete Forero et al. (2017), explained that the Wakatobi AIS was explicitly made to fit the needs of small Indonesian fishermen. To avoid confusing traditional fishermen, the shape, size, and energy used are designed to be as straightforward as possible. This tool is made to be carried around and has a battery that can power it for up to six days on a single charge every 96 hours. It is possible to monitor the location and movement of fishermen second by second at the receiving station (VTS) using the essential AIS function that is owned. It said that the Wakatobi AIS was built to connect to a ship traffic monitoring system (VTS) typically found in ports and shipping authorities. Wakatobi AIS can detect AIS devices on non-fishing vessels to prevent maritime accidents. The government in the past, also stated that one of the concerns with implementing measured fishing is the safety of Indonesian fishermen when sailing. Minister Trenggono also advocates developing a safety system for fishing vessels (Salinas de León, 2010).

*E-Log Book*

The government developed this application. More than 5,000 fishing vessels had utilized the e-log book until July this year (Trionawan et al., 2021). The e-log book is easy to use, and operational fishing data can be recorded with just five clicks of a button. Fishermen unable to read or write can use the fishing e-log book application, making it easier for ship captains to accurately and immediately report daily fishing records (Marwiati & Fahrurrozi, 2021). The skipper writes a daily report in this log book about fishing activities. The skipper's landing declaration or statement regarding catching fish resources (catches) at sea to be landed at fishing ports is recorded in the logbook. This method of collecting data using gadgets is beneficial, simple, and practical (Kiswanto, 2020). Paper is no longer used to record data about fishing operations. Businesses, businesses, and fishermen must first submit an activation application letter to the fishing port's harbor master before using the e-log book. The fishing e-log book application must be activated using this application. The harbormaster will print an activation receipt after activation. You will then receive a username and password for the e-log book application. This app can be downloaded offline or online. The existing data are directly integrated with the SILOPI application, so the skipper no longer needs to travel to the fishing port (Mion et al., 2015).

## Conclusion

By studying several fisheries data centers and supporting technology, we can finally investigate marine resources, especially digital fishing, to support a cultured community of fisheries technology. Supported by published sources in the form of scientific evidence, these findings are valid in answering the questions and hypotheses of this study. The results include the applications we investigated, including track fish, which is equipment for tracing and tracking the presence of fish. This is important because fishing efforts will only show maximum results with knowledge and predictions with possible means, and a technology-cultured society does not recommend this in the 21st century. Another thing is the Nusantara sea which is an application collaboration with the Telkomsel company to prepare this tool to monitor and provide information on the whereabouts and condition of fish ready to be caught. Likewise, the intelligent fishing application results from an innovative design by the Ministry of Maritime Affairs, where the fishermen's program needs support in the digital era. Then this Nusantara fishermen application is a website created to get information and experience on the role of Indonesian fishermen and assisted by a combination to ensure fishermen get technology services. Likewise, the Wakatobi Ais application is a radar tool that can detect the safety of the ocean. Likewise and the last one is the lengthy book application which is a development from the ministry of marine and maritime affairs to make an application that can be used for operational fisheries data in Indonesia. We realize that these findings certainly need to be improved in the method and the presentation. Therefore we ask for input in the form of constructive criticism.

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