

## Model Based Spatial For Monitoring Surveillance Of Fisheries Ships To Fishing Area At Aru Sea, Arafura Sea And East Timor Sea In FMARI 718

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### -----ABSTRACT-----

*This study is a pilot project was presented as to monitor species of fish under supervision in spatial data model for fisheries management in FMARI 718. Geographical position of 128°-141°E; 4°-11°S. The Spatiotemporal distribution and demographic profile of type fish in tree seas in 2013-2016. The purpose of this research is the formation of information model about fishing area in FMARI 718 which is related to four seasons of West Winter Transition I, East Winter and the Transition II. Methods in this research are (1) descriptive analysis, dealing with settlement, data summary and presentation of summarization result, to know the character of data set, and make data more informative. (2) Result data and spatiotemporal processed. (3) By using the application MapInfo15 software. In principle, data processing with Geographic Information Systems (GIS) are data entry, analysis and display that can display fishery data by surveillance in FMA RI718. The result of this research, expected to be utilized and give information to fisherman in fishing operation.*

**Keywords:** -GIS, Surveillance, Spatial data model, Spatiotemporal, FMA RI 718

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### I. INTRODUCTION

From the cessation of activities and fishing vessel inspection (“henrikan”) are certainly numerous fisheries data can be multi-year in-depth study and used as a base in the manufacture and development of model-based spatial database in connection with the fishing in the waters of FMA RI 718 . As a first step (pilot project) in monitoring the availability of model-based spatial surveillance of fisheries to see area zone type of fish in the cessation of operations and inspection vessel in the waters off from tree seas. This research is important in an effort to provide information on the status and development of capture fisheries to develop Model Monitoring Surveillance of Fisheries (MSF) or monitoring and surveillance of fisheries resources in an effort to apply the system Monitoring, Controlling, and Surveillance (MCS) as required code Of Conduct For Responsible Fisheries (CCRF)[1].

GIS is a computer system consisting of hardware, software, and brainware/ personal that is designed to efficiently enter, store, update, manipulate, analyze and present all types of geographically oriented information. GIS technology is developed and integrated from multiple concepts and techniques such as Geographical, Statistical, Cartography, Computer Science, Biology, Mathematics, Economics and geology. The GIS component divides into four sections, namely: input components (input), the components of data management, manipulation and analysis of data components and component output [2].

The reason is that the effort to develop monitoring of fisheries model-based spatial monitoring to get information about the fishing results of fishing vessels in FMA RI 718, it is a more integrated, so that the data and information obtained in the performance of “henrikan” be more organized and accessible quickly and easily by interested parties, so that the management of fishery resources in the study area can be implemented on an ongoing basis. The purpose of this study was the establishment of Fisheries Surveillance Monitoring Model to spatiotemporal[5] data in the termination of the operation and inspection of fishing vessels in FMA RI 718 waters[7]. The results of this study will hopefully contribute to marine science and fisheries that can be used to study other related sciences, such as oceanography, arrest and post-harvest.

### II. RESEARCH METHODS

This research is conducted for 10 months from January 2016 to October 2016. The research location is FMA RI 718 (128° -141° E ; 4° - 14° S). Primary data used in this study is the result of cessation of fishing data

and fishing vessel inspection in FMA RI 718, among others: Date and Geographical position, the number and type of fish, the number of fishing fleet. Secondary data is used Digital Indonesia nautical chart no.151 Papua & Islands in the vicinity, oceanographic conditions, contour 5m, 10m, 20m and 200m.

The tools used in the manufacture and processing of databases: one unit of computer and software MapInfo spatial data processing . Data spatial / spatial processed using MapInfo software[4]. In principle, the processing of data with geographic information systems (GIS) are data entry, data analysis and data display. Data entry associated with spatial data (spatial) and tabular data (textual). Spatial data is put through the process of scanning, digitizing or import data from existing digital maps. Textual data entry will follow the spatial data. Once data is entered, the next step is to process spatial data in accordance with the needs, for example: Geocode, Overlay, Buffering, Counting area. The last stage is the data display, display the data could be maps, graphs, tables, or storage in electronic media, such as multimedia. Some important spatial data processing operations used in this research is the process of digitizing the map, making the buffer, the overlay, and-processing and lay-outing the maps. With these capabilities, GIS technology is very useful in the management of coastal and marine resources spatially [3].

### III. RESULT AND DISCUSSION

Monitoring modeling spatial-based surveillance of fisheries to fishing has been done based fishery management area maps in the waters of eastern Indonesia, which is divided into 3 seas as Aru sea (131° - 139° E ; 4° - 8° S), Arafura sea (132° - 141° E ; 8° - 11° S) and East Timor sea (128° - 131° E ; 8° - 11° S). FMA RI 718 is a wide area of waters with big spatiotemporal data with point grid map will be presented in this study. To create a new grid (number of point) with one (°) degree to facilitate reading[6].

#### Model-Based Spatial for Monitoring Surveillance of Fisheries in "Henrikan" Operation based on the Types of Fish in WPP RI 718.

Model-based Monitoring Surveillance of Fisheries spatial, based on the type of fish recorded in "henrikan" operation for a period of 4 years (2013-2016) of each of its seas can be seen in table 1. Dominant fish species in all FMA RI 718 is a type of fish groups mixture [8].

**Table 1.** Grup/ Type of Fish.

	Indonesia Name	International Name	Latin Name	Dominan Type
Aru sea	1 ikan Campuran	Mixed fish	-	Common squids
	2 Cumi cumi	Common squids	Loligo sp	Mixed fish
	3 Udang	Prawn	Penaeus sp	Prawn
	4 Tenggiri	Spanish Mackerel	Scromberomorini	
	5 Tuna	Tuna	Thunnus sp	
Arafuru sea	1 Campur	Mixed fish	-	Common squids
	2 Cumi cumi	Common squids	Loligo sp	Mixed fish
	3 Udang	Prawn	Penaeus sp	
	4 Tenggiri	Spanish Mackerel	Scromberomorini	
	5 Tuna	Tuna	Thunnus sp	
East Timor Sea	1 Campur	Mixed fish	-	-
	2 Cumi cumi	Common squids	Loligo sp	
	3 Udang	Prawn	Penaeus sp	
	4 Tenggiri	Spanish Mackerel	Scromberomorini	
	5 Tuna	Tuna	Thunnus sp	

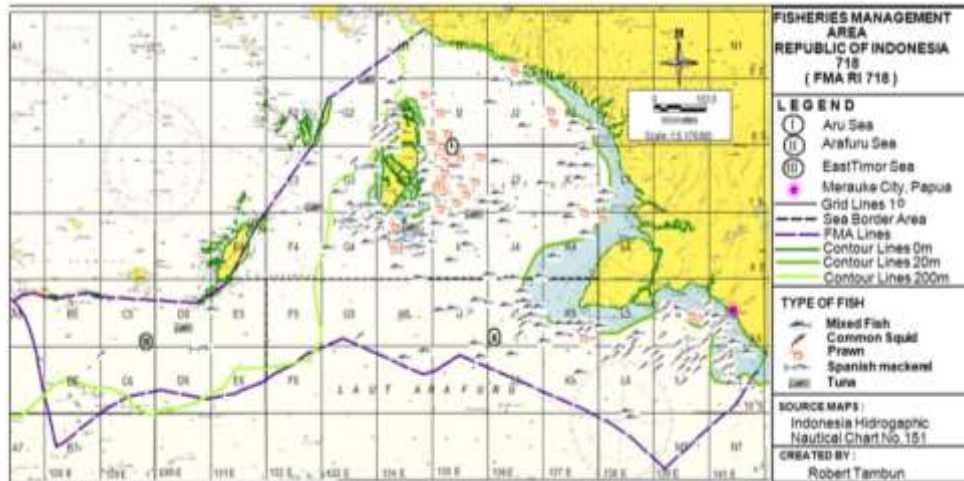


Fig. 1 Types of Fish at "Henrikan" in WPP RI 718 in 2013-2016

From the spatial model can be analyzed that the activities can be carried out with priority "Henrikan" to FMA RI 718 in Aru sea, where the number of operations for Common squids (182 times) "Henrikan" highest at zona H4 (144 times), Mixed fish (177 times) "Henrikan" highest at Zona H4 (36 times) and Prawn (130 times) "Henrikan" highest at Zona H4 (99 times) and from the graphs in Fig.2

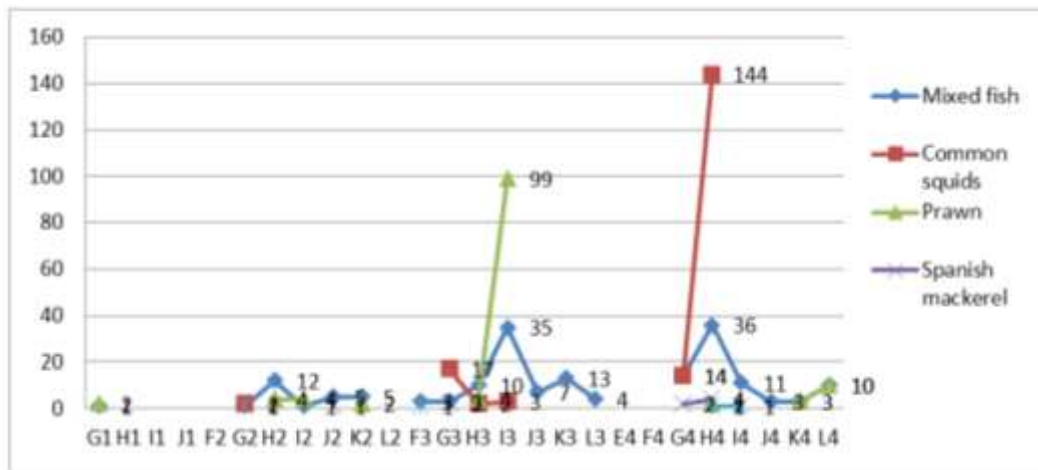


Fig.2 The frequency of each type of fish in the grid area in the Aru sea in 2013-2016

In Arafuru sea, where the number of operations for Mixed fish (70 times) "Henrikan" highest at Zona J5 (22 times), and Common squids (66 times) "Henrikan" highest at zona M6 (32 times) in Fig.3 In East Timor sea, common squids(4 times) and "Henrikan" highest at zona C6 (3 times) in Fig. 4

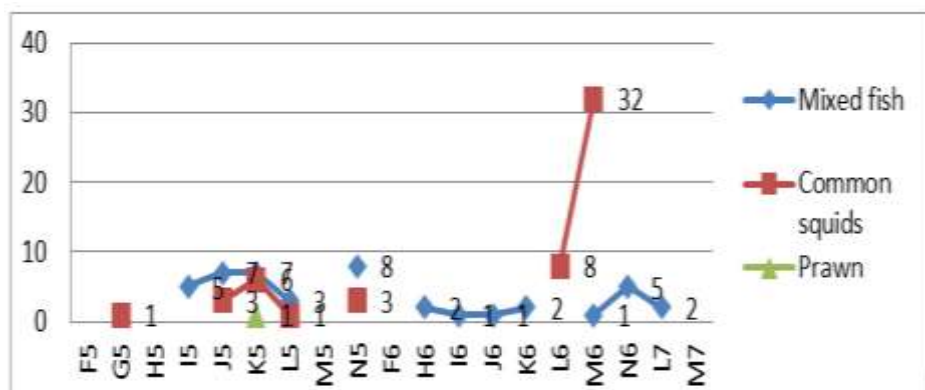


Fig. 3 The frequency of each type of fish in the grid area in the Arafuru sea in 2013-2016

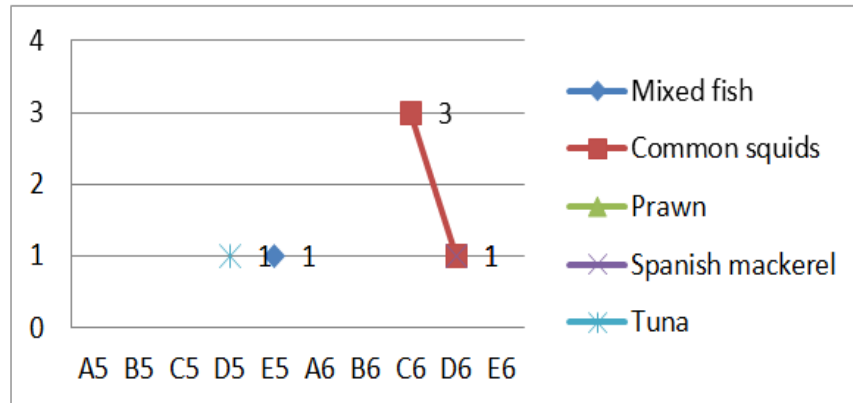


Fig. 4 The frequency of each type of fish in the grid area in the East Timor sea in 2013-2016

**Model Based Spatial for Type of Fish in "Henrikan" Operation Base in FMA RI 718**

From the data collection records of fishing vessels there are 3 main categories of fish, namely mixed fish, squid and shrimp. so that fishing operations can be seen on the 20-200 m contour. shrimp tend to be in aru sea and squid are in the arafuru sea. The Geocode proses results can be seen on thematic maps (fig. 5, fig. 6 and fig. 7).



Fig.5 Thematic map for zona area Mixed Fish



Fig.6 Thematic map for zona area Common Squid

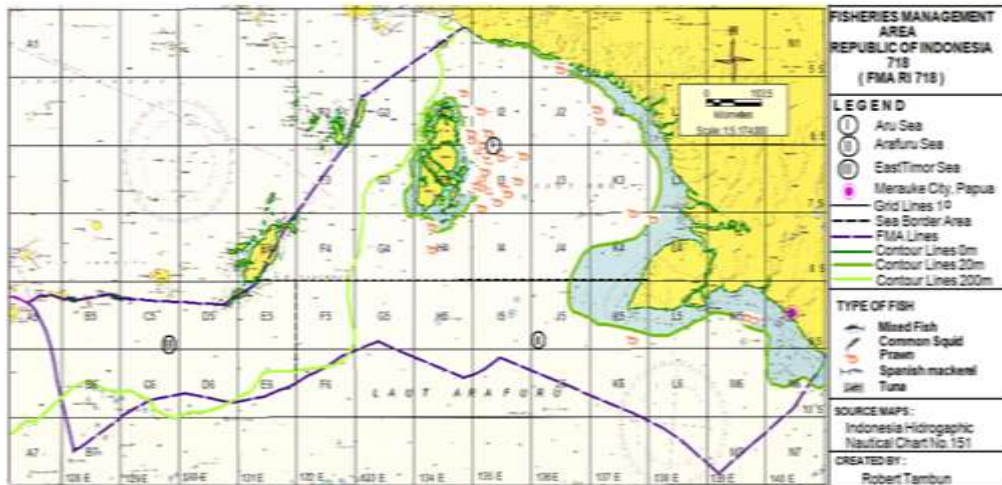


Fig.7 Thematic map for zona area Prawn

**Model Based Spatial for Monitoring Surveillance of Fisheries in "Henrikan" Operation based on Seasons in FMA RI 718.**

Model-based Monitoring Surveillance of Fisheries spatial, seasonal "Henrikan" in operation for a period of 4 years (2013-2016) of each of seas can be seen in table 2 and figure 8, 9, 10 and 11. At spatial models below can be seen that the operation "Henrikan" between 2013-2016 there is at four seasons are: the Winter West (December-February), Transitional I (March-May), the Winter East (June-August) and the Transitional II (September-November) and spread over Aru sea, Arafuru sea and West Timor sea in FMA RI 718. Operating "Henrikan" dominant Western winter (221 times) and Transition II (181 times) season Grouping vessel is divided into Fisheries vessels.

**Table 2.** Distribution operations at FMA RI 718 by Seasons, 2013-2016

No	Seasons	Mixed fish	Common Squid	Prawn	Spanish Mackerel	Tuna	Total
1	West Winter	68	119	33	0	1	221
2	Trantional I	51	37	19	1	0	108
3	East Winter	18	11	6	1	1	37
4	Trantional II	41	97	33	7	3	181



Figure 8. Distribution of Henrikan Operation Based on West Winter in FMA RI 718 in 2013-2016

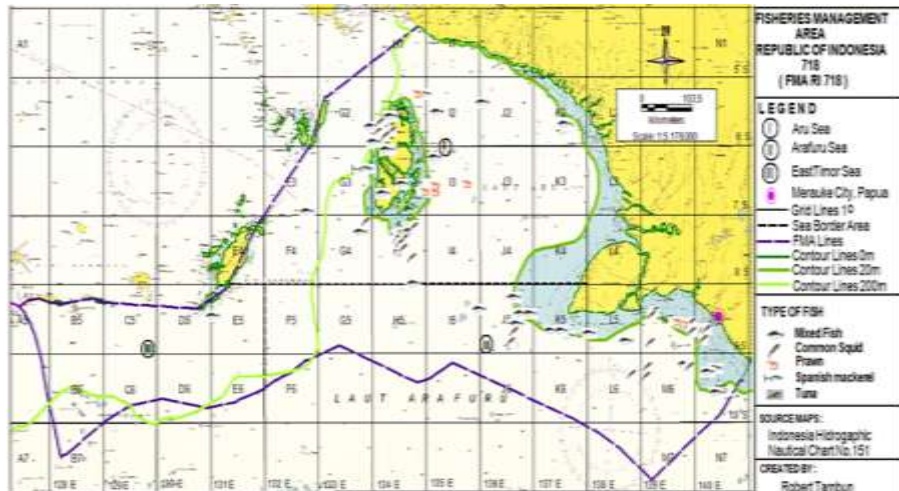


Figure 9. Distribution of Henrikan Operation Based on Transition I in FMA RI 718 in 2013-2016

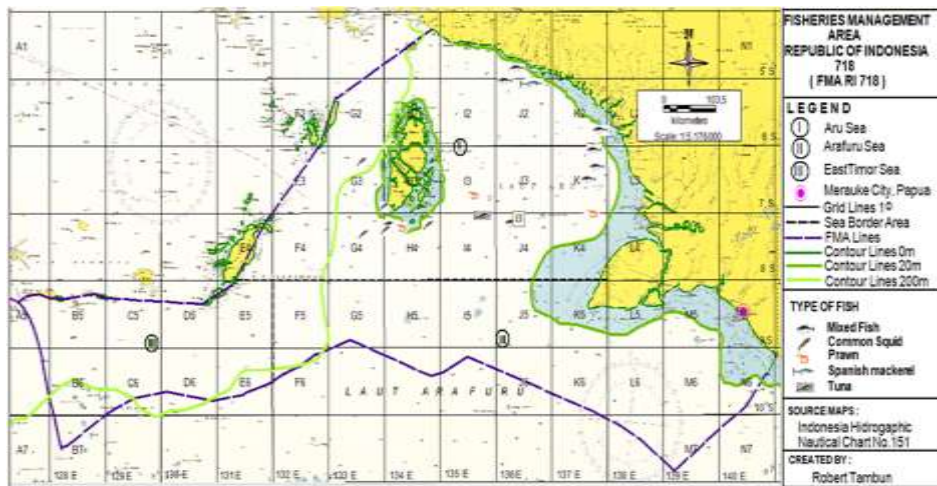


Figure 10. Distribution of Henrikan Operation Based on Winter East in FMA RI 718 in 2013-2016

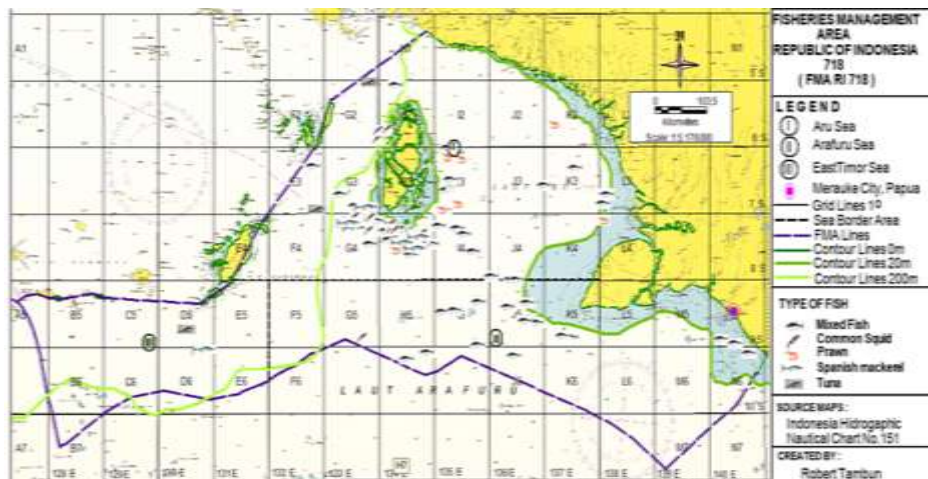


Figure 11. Distribution of Henrikan Operation Based on Transition II in FMA RI 718 in 2013-2016

#### IV. CONCLUSION

From the results of this study concluded:

Model-based spatial for monitoring surveillance of Fisheries in the "Henrikan" operations based on Aru sea(502 times), Arafuru sea (140 times) and East Timor sea (7 times) type in Fish is dominated the Common squids, Mixed fish and Prawn.

Model-based spatial for monitoring surveillance type of fishis dominated the Common squids at zona H4, G4 and G3 (Aru Sea), zona M6 (Arafuru Sea), the Mixed Fish is dominated at zona H4 and I3 (Aru Sea), zona J5 (Arafuru Sea), the Prawn is dominated at zona I3 (Aru sea).

Model-based spatial for monitoring surveillance of fisheries in the "Henrikan" operations based seasons in WPP RI 718 is dominated by the West winter and Transition II.

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#### **REFERENCES**

- [1]. Mukhtar, 2011. Landasan koseptual dan mandat pengawasan sumber daya kelautan dan perikananTata Laksana Perikanan Yang BertanggungJawab.Surabaya,21Maret2012.<http://www.goblue.or.id/wp-content/uploads/kode-etik-perikanan-yang-bertanggung-jawab.pdf>.
- [2]. Aronoff, Stanley. 1989.Geographical Information Systems : A Management Perspective.Ottawa, Ontario, Canada : WDL Publications
- [3]. Prasita V. Dj. dan A. Rauf. 2006. Pelatihan ArcView 3.1. Sistem Perencanaan Pembangunan Kelautan dan Perikanan, Biro Perencanaan dan Kerjasama Luar Negeri, Sekretariat Jenderal Departemen Kelautan dan Perikanan Jakarta.
- [4]. MapInfo. Software GIS.Download the setup MapInfo di <http://web.pb.com/minpro15-2>. 27 February 2017
- [5]. Mayo, Cynthia L. Browning1, and Moira W. Brown2, 2004. Surveillance, Monitoring and Management of North Atlantic Right Whales in Cape Cod Bay and Adjacent Water – final report. Center for Coastal Studies 59 Commercial Street, P.O. Box 1036 Provincetown, MA 02657 December 2004.<http://www.coastalstudies.org/pdf/2004DMFReport.pdf>.
- [6]. Mengjie Z, Jing T, Fuquan X & Rui W. 2016. Point grid map: a new type of thematic map for statistical data associated with geographic points. <http://dx.doi.org/10.1080/15230406.2016.1160797>
- [7]. Rosana N, Prasita V.Dj, Tambun R. 2014. GIS for Monitoring the Operation on Inspection and Termination of Fishing Vessels in the Eastern Indonesian Waters. The International Journal of Engineering and Science. Vol 3-Issue 3, version IV. March 2014. Page 20-28.The International Journal Of Engineering And Science (IJES).[www.theijes.com](http://www.theijes.com)
- [8]. Rosana<sup>1</sup> N, Prasita VD, Tambun R. 2014. Model based Spatial for Monitoring Surveillance of Fisheries to Ward Illegal Fishing in Waters of Eastern Indonesian. Volume 3 , Issue 10, Pages 1-7. The International Journal Of Engineering And Science (IJES).[www.theijes.com](http://www.theijes.com)

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