Feedback Fishermen of Spatial Information About The Potential Fisheries Indonesia Zone Based On MODIS Image

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***Abstract*—** Indonesian marine fisheries potential is very abundant, but has not been used optimally and evenly, in some waters still open great opportunities for the development of utilization, while in some other areas the waters have reached solid state gear (overfishing). Likewise, the welfare conditions of fishermen uneven and even most of the traditional fishermen still at the level of indigents. Marine fish resources are not evenly distributed and pre-prosperous fishing conditions can be caused by the management of the fish resource potential has not been implemented in an integrated manner, ranging from the ability of local governments as direct supervisors, the ability of its own fishing fleet, facilities and infrastructure as well as the knowledge and availability of data and of information. One reason is the unavailability of data and information on potential marine fishery resources Indonesian waters are spatially and temporally. The potential use of the marine fish resources can be improved, either by providing data and information on the locations predicted as a gathering place for fish (The Potential Fisheries Indonesian Zone / ZPPI). Further research results are disseminated to policy makers in the area or directly to the fishermen. The activity at issue is how to disseminate information generated from research and how that information can be utilized. Remote sensing data to support fishing activities have been widely available, but its use and capabilities in the areas of human resources and related services that have not been able to independently process and utilize data. After information on the prediction of the location of fishing available, then clash with the local social and cultural conditions may occur, they can't accept new paradigms and technological developments in fishing as well as some technical problems that may arise during the implementation of which is the condition of the waters of data still often covered with clouds, so it can't continue processing for extraction SPL and chlorophyll-a, weather conditions do not allow for field testing in North Sulawesi waters and the fishing fleet fishing capacity that has not been possible to reach locations ZPPI located far offshore This activity aims to disseminate and utilize data and research information. The data used is the image of low resolution satellite remote sensing (MODIS) and the resulting information is Potential Fishing Zone. Location of the target data and dissemination of this information is in the region of North Sulawesi waters, involving several agencies for the purpose of fishing builder so that there is feedback from the catch**.**

Keywords—fisherman; modis; temperature; chlorophyl; spatial information

I. INTRODUCTION

Indonesian sea waters have a resource potential of marine fish are abundant, both small pelagic, large pelagic fish, and demersal fish. However, this potential has not been utilized optimally and evenly, in some waters still open great opportunities for the development of utilization, while in some other areas the waters have reached solid state gear (overfishing). Likewise, the welfare conditions of fishermen uneven and even large sebgaian traditional fishermen still at the level of indigents. Marine fish resources are not evenly distributed and the underprivileged fishing conditions can be caused by the management of the fish resource potential has not been implemented in an integrated manner, ranging from the ability of local governments as direct supervisors, the ability of its own fishing fleet, facilities and infrastructure as well as the knowledge and availability of data and of information. One reason is the unavailability of data and information regarding the resource potential of marine fish Indonesian waters are spatially and temporally.

The potential use of the marine fish resources can be improved, either by providing data and information on the locations predicted as a gathering place for fish (Potential Fishing Zone / ZPPI). Currently available remote sensing technologies that can be used to support efforts to increase the utilization of fisheries resources as has been done in some developed countries such as Japan, Australia and some European countries. Utilization of remote sensing technology for marine and fisheries should be initiated and supported by numerous studies to understand the dynamics of the marine environment and biological resources contained therein. Further research results are disseminated to policy makers in the area or directly to the fishermen. National Institute Aeronautics and Space (LAPAN) has since 1986 conducted a study utilization of remote sensing satellite to monitor sea water physical. In 1990 already implemented remote sensing data applications for the determination of the potential area farms, in 2000-2001 carried out mapping of coral reefs across Indonesia, and since 2002 held ZPPI spatial information applications based on remote sensing data is to support efforts to increase fish catches by fishermen. Development of a model for the utilization of remote sensing satellite data ZPPI information that is already operational using SPL parameter-

based optical remote sensing satellite data, ie the data NOAA-AVHRR satellite data and Terra / Aqua (MODIS). Optical remote sensing satellite data have weaknesses, ie when the location of the object of observation of cloud cover, the Sea Surface Temperature (SPL) information can not be obtained, as well as information / other parameter above sea level. Alternative to overcome these obstacles is to develop a model of information-based SPL ZPPI using micro satellite data, one of which is data TMI.

Several studies on the extraction of data based on the data TMI SSTs have been done, among other things, study the dynamics of global sea surface temperature using microwave remote sensing data is [1] data extraction SPL using the data TMI [2]; availability SPL using infrared and microwave satellite data [3]; SPL data extraction based on the data in the Bay of Bengal TRMM Microwave Imager [4]. The research results suggest the potential use of data extraction TMI for SPL, but has not been implemented and applied in Indonesian waters. Hall of Remote Sensing (CPM) is the Pare-Pare Technical Unit (UPT) in the field of remote sensing in charge of implementing the reception, recording and data processing satellite remote sensing of natural resources, environment and weather, as well as distribution and technical service of satellite remote sensing data utilization. CPM Parepare currently recording environment and weather satellites, namely Terra and Aqua and can produce up to level 2A data. During these remote sensing data is distributed only to Bank of remote sensing data in Jakarta for further utilization. In line with changes in the task function, so now the data can be distributed directly to users who are not limited by administrative region. One form of environmental remote sensing data dissemination and the weather is in the format of spatial information ZPPI. Surely ZPPI information is not solely the task of Pare-Pare Space agency and CPM in particular, but in order to develop its use, then the dissemination utilization. ZPPI is one form of spatial information containing prediction of potential locations for fishing. CPM Parepare currently executing data processing to obtain spatial information ZPPI, but the next program is to build self-reliance in the area of processing and utilization of remote sensing data is through the dissemination package. This package is realized in the dissemination of technical guidance sensor MODIS remote sensing data processing and utilization as well as the use of information ZPPI build a data flow sensing with the Department of Marine and Fisheries and Ocean Fishing Port Bitung in North Sulawesi region in order to reach self-sufficiency in processing, analyzing and making ZPPI spatial information.

The activity at issue is how to disseminate information generated from research and how that information can be utilized. Remote sensing data to support fishing activities have been widely available, but its use and capabilities in the areas of human resources and related services that have not been able to independently process and utilize data. After information on the prediction of the location of fishing available, then clash with the local social and cultural conditions may occur, they can not accept new paradigms and technological developments in fishing as well as some technical problems that may arise during the implementation of which is the condition of the waters of data still often covered with clouds, so it can not continue processing for extraction SPL and chlorophyll-a, weather conditions do not allow for field testing in North Sulawesi waters and the fishing fleet fishing capacity that has not been possible to reach locations ZPPI located far offshore .

II. LOCATION AND DATA

In this study do as much as 6 study areas, ie areas 5, 6, 13, 14, 21 and 22, the location in Sulawesi, West Nusa Tenggara, and East Nusa Tenggara, in Fig. 1

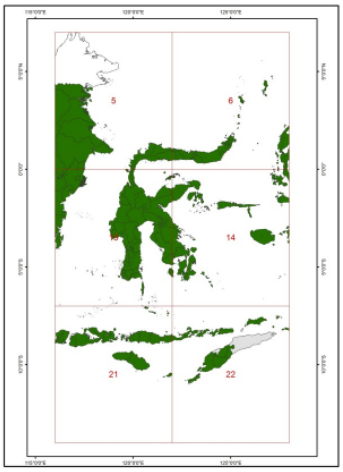

Fig 1. Project area of processing, production and dissemination of spatial information ZPPI

In this section of the reasons for the use of imagery delivered MODIS: alternative uses NOAA AVHRR data has been carried out from June, but even at different acquisition by MODIS, the cloud is not always shifted away, some granule NOAA is sometimes cleaner than MODIS. SPL NOAA data shows sometimes dubious, namely that SPL information generated on the same day with MODIS data equally cloud-free, thermal fronts produce different information, different both from the location and number of events (Fig. 1, 2 and 3). Differences in the location of thermal fronts in one day still may happen, but the difference in the number of locations that too much thermal front is very dubious. The cause may be due to an error at the time of production data or due to operator error or due to the condition of the actual data is still affected by thin clouds that are not visible. So some granule NOAA thermal frontnya clean but the amount is too much, is not used for prediction ZPPI, which is why the amount of information from NOAA ZPPI still low.

In addition to differences in thermal fronts, the data also shows the SPL NOAA geometric distortion, as is done with the data vector administration overlay Indonesian region (administrative boundaries of the map indications issued Bakosurtanal), further to the north of the greater distortion (Figure 3.11). Based on these images can be explained that the land area in the image shifted from the mainland on the

administrative map, but for the central and southern part of the island of Sulawesi distortion decreases (Fig 4.)

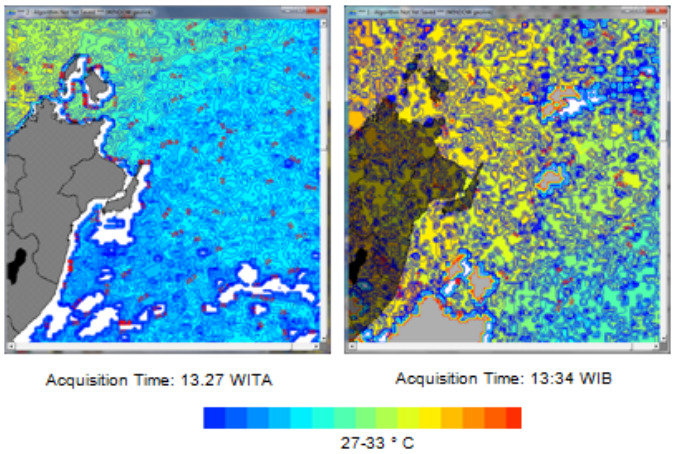

Fig 2. The difference between the image formation of thermal fronts SPL SPL NOAA and MODIS image of the same date (June 17, 2012) and the same location

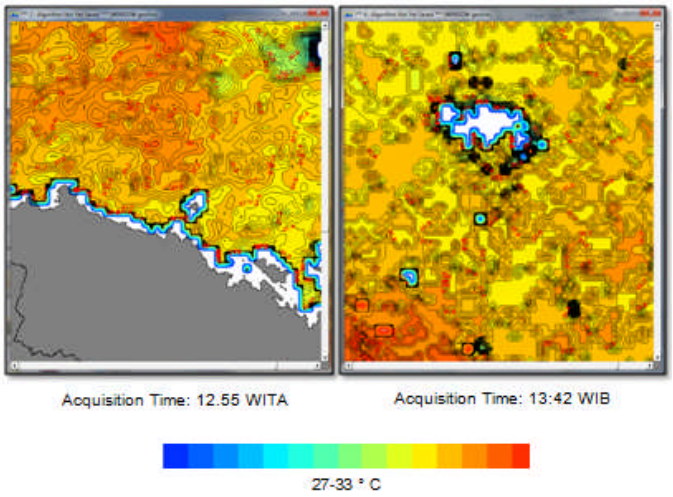

Fig 3. Differences formation of thermal fronts between imagery SPL NOAA and the image of SPL MODIS on date of who same (June 7th, 2012) and the same location

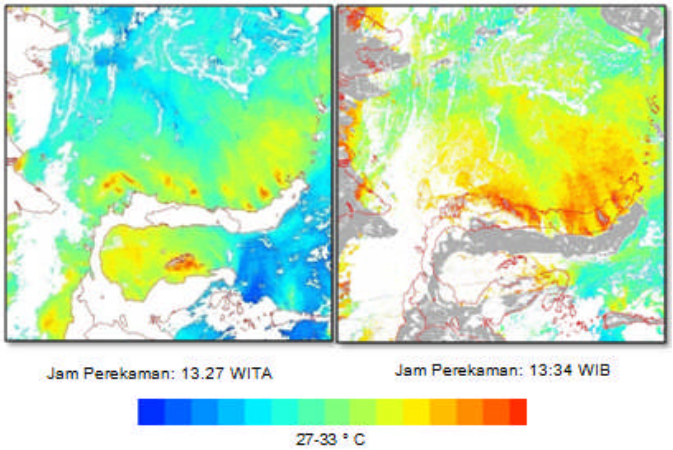

Fig 4. Differences position of the earth (geometric distortion) between image SPL SPL NOAA and MODIS image of the same date (June 17, 2012) in the northern part of the image

III. METHODOLOGY

In this research there are two (2) major done of doing the development of remote sensing data processing and disseminating information to local government agencies as well as fishermen. The data used is the image of MODIS level IB and 2A levels, daily data processing MODIS Level 2A generate sea surface temperatures (SSTs) and chlorofil (Chl) are from the MODIS Level 1B processing produce true color image (RGB). Of parameters SPL, Chl, and true colors can be used for analysis of thermal fronts, analysis of cloud density and percentage, of the three can be used to determine the location of potential ZPPI,in Fig 5.

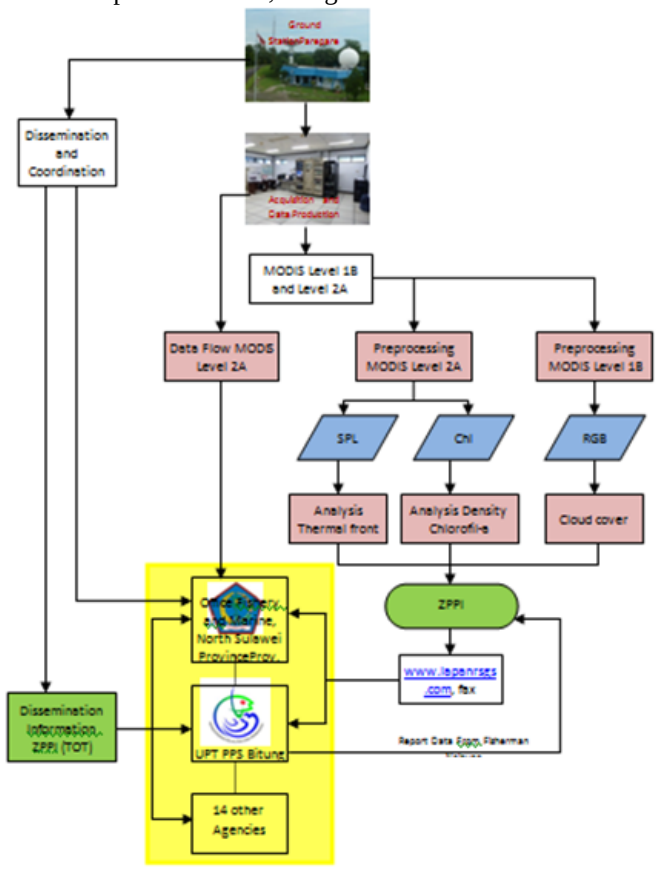

Fig 5.. Process flow chart of research achievement

Determination of SPL is done with stages as follows.

a.Correction geometric, done to get a imagery which accordance with the coordinates the position of locations in surface of the earth.

b.Calculation radiance canals thermal, done for convert the value pixels (digital number) into in the the form of radiance as an parameter who used in the calculation SPL.

Determination SPL from satellite data Terra / Aqua (MODIS) canal 31 and 32 done

$$SPL = k1 + k2 + k3 \; x \; x \; Tb31 \; (Tb31 - Tb32) \; x \; BSPL + k4 \; x \; (Tb31 - Tb32) \; x \; (1/\cos(\theta) - 1) \quad (1)$$

Description:

Tb 31: Brightness Temperature Channel 31 and 32

Tb 32: Brightness Temperature Channel 31 and 32
BSPL: SPL Reynold or Brightness Temperature SPL Reynold Channel 20 If there is no
θ: Angle zenith satellite
Constants: k1 = 1.152; k2 = 0.96; k3 = 0.151, and k4 = 2.021
Chlorophyll-a concentrations in the ocean surface data is derived from Terra / Aqua MODIS. based method of Carder et al. (2003) as follows:

Log (Chl a)= c0 + c1 x log (R35) + c2 x (log (r 35)) 2 + c3 x (log (R35)) *(2)*

Description:
R35 : ref (488) / ref (551)
ref (488) : reflectance channel 10
ref (551) : reflectance channel 12
Coefficients : c0 = 0.2818; c1 = -2.783; c2 = 1.863, and c3 = 2.387

Production ZPPI spatial information using a data SPL (obtained from NOAA-AVHRR data and Terra / Aqua MODIS) data and chlorophyll-a (obtained from the data Terra / Aqua MODIS), while the surface current is the data to support their analysis. Production of spatial information ZPPI done through the following steps.
• Determination and analysis ZPPI based values SPL, chlorophyll-a, and the current pattern.
• Analysis to identify thermal fronts SPL / SPL upwelling with gradient constraints for each within 3 miles (3 pixels) ranged from 0.5^0 to 1^0 C;
• Analysis of chlorophyll-a concentration for the identification of chlorophyll-a concentration, with limits on the relevant zone ≥ 0.3 mg / l.
• Making ZPPI spatial information sheet on each project area that includes the geographical position (latitude and longitude) ZPPI location and direction of surface currents, as well as some other information that is written on the legend sheet information.
• Sheet ZPPI spatial information is presented in A4 size paper so easily sent and received via facsimile machine.

Then, ZPPI spatial information sheet sent to various agencies / institutions, such as: Department of Marine and Fisheries, Cooperative Village Unit, Higher Education, School of Fisheries and fishing groups via facsimile or e-mail so that the information can be received by users / fishing immediately. Distribution of information in the receiving area by local officials who have been appointed and trained. The next local officials to report the distribution and application of spatial information ZPPI. Information about the agency and contact person receiving the data is still in the stage of socialization and coordination to work together

Table 1
Spatial Information in March s / d September 2012 MODIS Image Analysis Results

No.	Zone	Marine Areas	Total ZPPI						
			March	April	May	June	July	August	September
1	5	East Kalimanatan, Gorontalo							
2	6	Manado	2			5	1	1	
3	13	Selat Makasar, Bulukumba, Selayar	1	7	3	4	3		2
4	14	Wakatobi, Banda Sea	1		1	1			
5	21	West Nusa Tenggara, East Nusa Tenggara			2	4			
6	22	East Nusa Tenggara, Flores		3	1	1	1		

IV. RESULT OBTAINED FISHERMEN CATCH FISH

Results of the analysis and validation of spatial information ZPPI dated March 19, 2012 shows the location of fishing by fishermen nobody is in the area ZPPI with Radius <3 kilometers, the majority of the fishing is at a radius> 12 Kilometer that as many as 21 points (with a board number 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 13, 14, 15, 16, 17, 18, 19, 21 and 22). While only 2 fishing boats that are in the area ZPPI 9-12 Kilometer Radius of the vessel ship numbers 10 and 20. Point location Fishermen catching fish with the biggest catch lies in the number 7 KM. Nutrindo PM - 04 with a total catch of 1,225 kg, with a range of areas outside the radius ZPPI kilometer.Lokasi 12 fishermen who were fishing on the KM radius of 9-12 kilometers. King Steward (No. 10) with a total catch of 180 kg and KM. Seabirds - 01 (No. 20) with a total catch of 40 kg.

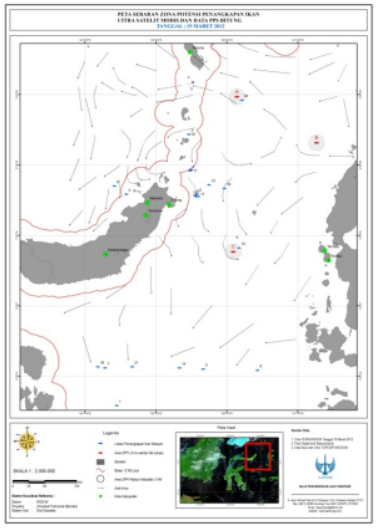

Figure 3. 3 Situation fishing locations and information ZPPI on 19 March 2012

Location fishermen catch fish based on data PPS Bitung on March 27, 2012 compared to the point ZPPI Modis satellite imagery analysis, then the radius of <3 km and 3-6 km from the point ZPPI not found the location of the fishermen catch fish. Location fishermen catch fish with a radius of 6-9 km from titk ZPPI there is one point that is the location of fishing catches at point C ZPPI with number 1 fishing boat with the proceeds catches 80 kg, while the location ZPPI A and B there are ZPPI trapping sites by fishermen. At a radius of> 12 Km from titk ZPPI or outside zone ZPPI point there are several

point locations such as the location of the fishing boats catching fishermen with catch numbers 3,4 and 5, where the majority of the catch obtained fishing vessel number 4 as much as 300 kg

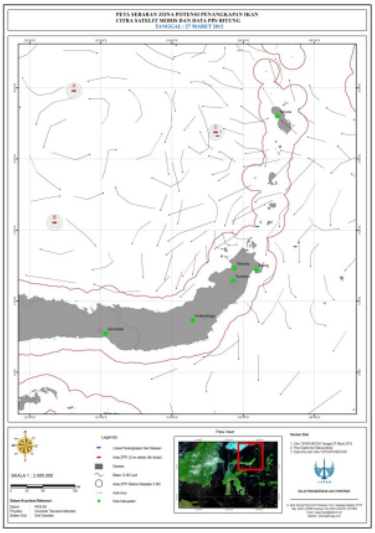

Figure 3. 3 Situation fishing locations and information ZPPI on 27 March 2012

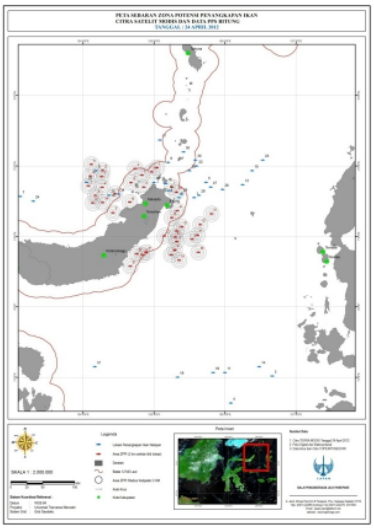

Figure 3. 3 Situation fishing locations and information ZPPI on 24 April 2012

Situation Fishing Date 24 April 2012 based Potential Fishing Zone Modis Satellite Imagery and Data PPS Bitung is presented in Figure 3.6.Lokasi catches PPS Data nelayanberdasarkan Bitung on April 24, 2012 compared to the point ZPPI Modis satellite imagery analysis, then the radius <3 Km from the point ZPPI not found the location of the fishermen catch fish.the radius of 3-6 km from the point ZPPI there is one location titk arrests fishermen fish at the point ZPPI v fishing boat with number 34. Location fishermen catch fish with a radius of 6-9 km from titk ZPPI there are three locations of the fishermen catch fish at the point f ZPPI with fishing boat number 24, titk ZPPI l with fishing vessel numbers 8 and 9, and point to the number ZPPI m fishing vessel 28. At 9-12 Km radius between ZPPI point (a, b, z, y) there is a titk fishing fishing boats fishing with number 0, and the point ZPPI L with number 15 fishing vessels, as well as titk ZPPI m with number 2 fishing boats . At a radius> 12 km from titk ZPPI there are many locations of the fishing. Most of the catch is obtained by fishermen with fishing boat number 33 as much as 993 kg and the vessel catching the number 36 as much as 924 kg, with the location being away from the capture point coordinates ZPPI, nor with the lowest catches obtained with the number 24 fishing boats with trapping sites are outside the zone ZPPI point

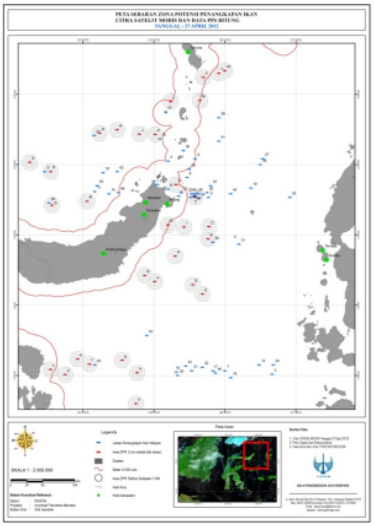

Figure 3. 3 Situation fishing locations and information ZPPI on 27 April 2012

Location fishermen catching fish on 27 April 2012 and vary from area ZPPI with Radius <3 Kilometers as many as 1 point (with the boat number 1). Then the location Fishermen catching fish that are in the area with a radius of 3-6 Kilometres ZPPI as many as 2 point (with the boat number 34 and 40). Location fishermen catching fish that are in the area with a radius of 6-9 Kilometres ZPPI as many as 6 points (with the boat number 22, 23, 29, 34, 45 and 54,) and the most distant locations fishermen who are catching fish in the area ZPPI 9-12 Kilometer radius of as many as 4 points (with the boat number 5, 15, 21 and 50). Location fishermen catching fish that are in the area ZPPI with Radius> 12 Kilometer that as many as 41 +5 point (with ship numbers 0, 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, 13, 14, 16, 17, 18, 19, 20, 24, 25, 26, 27, 28, 30, 31, 32, 33, 35, 36, 37, 38, 39, 41, 42, 43, 44, 46, 49, 51, 52 and 53). Point location Fishermen catching fish with the biggest catch lies in the number 16 KM. Noah with a total catch of 1,500 kg, with a range of areas outside the radius ZPPI kilometer.Lokasi 12 fishermen who were fishing on the KM radius of 3 kilometers. Yulovin-04 (No. 1) with a total catch of 60 kg. while those in the 3-6 kilometer radius of the Glory KM-18 (No. 34) with a total catch of 45 kg and KM Wahyudin (No. 40) with a total catch 66 kg.

Fishermen catching fish location on May 8, 2012 which is in Area ZPPI with Radius> 12 Kilometer that as many as 31 points (with ship numbers 0, 1, 2, 3, up to 30). Point location Fishermen catching fish with the biggest catch lies in the number 25 KM. Tarsier PM - 15 with a total catch of 555 kg,

with a range of areas outside the radius of 12 kilometer.Lokasi ZPPI fishing fisherman who got closest to the KM radius of 12 kilometers. Wira (No. 23) with a catch of 48 kg and the amount of KM. Jasmine - 07 (No. 1) with a total catch of 112 kg

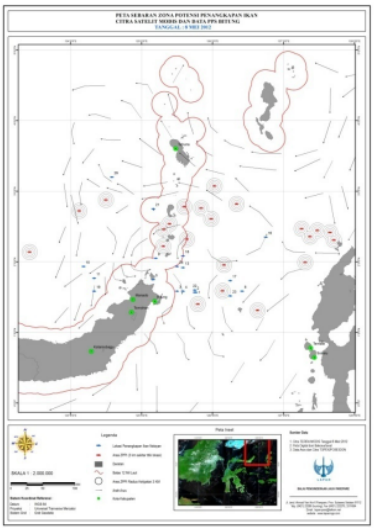

Figure 3. 3 Situation fishing locations and information ZPPI on 8 May 2012

V. CONCLUSIONS

Results derivative image processing MODIS Level 2A for the purpose of generating Indonesian Fishery Zone (ZPPI) is the sea surface temperature, chlorofil, to improve the accuracy of the processing carried out field surveys. In this study ZPPI products distributed to fishermen in Bulukumba and Wakatobi, the analysis deals with the transformation of knowledge into fishing takes quite a long time with a training method that is simple, attractive, in accordance with appropriate language comprehension controlled fishing. The dissemination activities still require follow-up activities, especially for coaching directly to fishermen. Guidance to policy makers do not necessarily produce the policy direction of the dissemination program. If coaching is accompanied by the revitalization of facilities and supporting infrastructure, such as image processing computer package, then the chances of sustainability is the dissemination of the results will be monitored. Coaching is done directly to the fishermen and is equipped with a means of supporting the delivery of assets

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