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STOCK STUDY OF ARWANA IRIAN FISH IN WANGGO RIVER OF SOTA DISTRICT

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ABSTRACT

Irian Arwana Fish is one type of potential ornamental fish that has high economic value. Some rivers in Merauke Regency are categorized as arwana fish production centers, one of which is Wanggo River. The high market demand for Irian Arwana fish encourages local people to make arrests continuously. The purpose of the study was to determine the value of MSY and Fopt and determine the stock status of Irian Arwana Fish on the Wanggo River. The study was conducted for 2 months with data analysis including CPUE, MSY and Fopt. The results showed that the sustainable potential value (MSY) of Irian Arwana fish in Wanggo River was 521,358 with Fopt 5000 trip. Stock of Irian Arwana Fish is classified as under fishing because the number of catches and catching efforts have not passed the total MSY and Fopt, so that fishing efforts can still continue, while maintaining the specified MSY and Fopt limits.

Keywords: Arwana Fish, MSY, Stock, Wanggo River

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1. INTRODUCTION

Irian Arwana Fish (*Scleropages jardinii*) is one type of potential ornamental fish that has high economic value. Fish belonging to the Osteoglossidae tribe and known as the bony tongue because it has lida whose shape is like bone has a wide spread which is almost on all continents except continental Europe (Helfman et al., 1997; Kottelat et al., 1993) and these fish including carnivorous fish by eating surface feeders with natural feed in the form of microcrustaceans, insects, small fish and a little plant material (Allen, 1991).

Several rivers in Merauke Regency are categorized as arwana fish production centers including the Maro River, Kumbe River, Bian River, Rawa Biru, Unum, Wamek, Buraka, Malo, Heli, Rugai, Dambu, Mambu, Tabonji, Red, Bogeram and Korimen (Satria et al., 2014) Wanggo River which is one of the rivers in the Merauke Regency area right in Erambu

Village, Sota District. Wanggo River has a variety of potential fish resources so that fishing activities continue, one of the potential fish resources found on the Wanggo River is arowana irian or kaloso which is the local name of the local area. Irian arowana fishing is quite large, especially in the rainy season, namely in November to February.

Irian arwana has beauty and uniqueness and has high economic value making it an export commodity. At first the marketing of Irian Arwana fish was only intended to meet the needs of the domestic market, but until now Irian Arwana fish has been marketed to foreign countries, so the selling value has also increased. The large number of market demands from both domestic and foreign countries has encouraged local people to overtake arowana. The high catch can result in a decrease in the stock of arowana fish that are available in nature, so it needs to get serious attention in efforts to use it. The business can be carried out by managing utilization and protection so that the level of exploitation is not excessive and stocks in nature remain sustainable.

Research carried out according to Satria et al. (2013) concerning the abundance of arowana fish stocks in Merauke Regency. Data and information concerning the Stock Potential Study of Arowana Fish at arwana fish production centers in Merauke Regency does not yet exist, so there is a need to conduct a Study of Irian Arwana Fish Stock on the Wanggo River in Erambu Village, Sota District, Merauke Regency. Study of Irian Arowana Fish Stock in this study includes CPUE, MSY and Fopt Analysis.

Based on the description above it is necessary to do research on

1. MSY (Maximum Sustainable Yield) and Fopt (optimum fishing effort) Arwana Irian fish on Wanggo River, Erambu Village, Sota District, Merauke Regency.

2. Status of Arwana Irian fish stocks on Wanggo River, Erambu Village, Sota District, Merauke Regency, whether under fishing or over fishing.

2. METHODOLOGY

This research was conducted in May - June 2017 at Wanggo River, Erambu Village, Sota District, Merauke Regency.

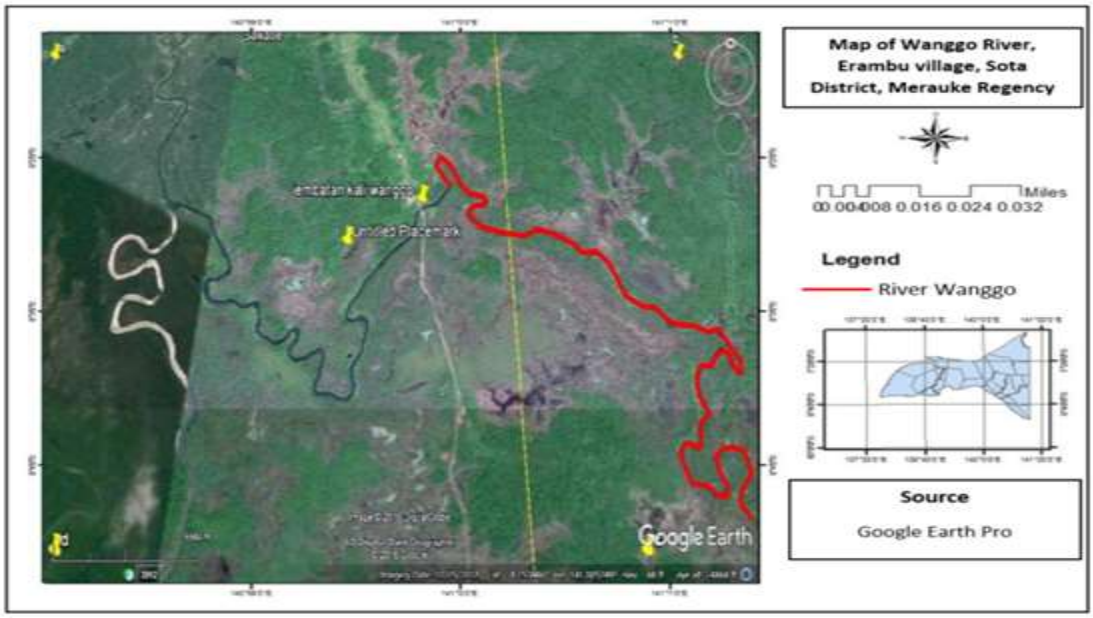

Figure 1. Research Location Map

The method used in this study is the survey method. Sugiyono (2013) suggested that the survey method is a method for obtaining existing data at the time the research was conducted. This survey method can be in the form of a descriptive survey aimed at obtaining information and an overview of the situation and events systematically and exploratively (Fachrul, 2008; Hidanah et al., 2016; Kotta et al., 2018).

The data obtained in this study include Primary Data and Secondary Data are as follows:

- Primary Data, is the fishing area data obtained from interviews with several fishermen directly in the field, including fishing season, fishing gear used and information about the location of the study.
- Secondary Data, is a periodic data (Time Series) of catches and fishing efforts from 2008 to 2017 on the Wanggo River. In addition, secondary data collection will also be carried out library searches and data obtained from relevant government agencies namely the Papua Natural Resources Conservation Center and production data from UD. Bintang Mahkota Utama, CV. Tunas Abadi and CV. Putri Lestari.

Analysis of Catch Results per Catching Effort (Catch per Effort Unit) According to Gulland (1983) the formula used is as follows:

$$CPUE = \frac{Catch}{Effort} \quad 1$$

where:

Catch = total catch (kg)

Effort = total catch effort (hauling)

CPUE = catch per catch effort (kg/hauling)

Formulas for searching for sustainable potential (MSY) only apply if parameter b is negative, meaning that for additions it will cause a decrease in CPUE. If in the calculation obtained a positive value of b, then the calculation of potential and optimum fishing effort is not continued, but it can only be concluded that the addition is still possible to increase the catch. The parameters a and b can be mathematically searched using a simple regression equation with the formula:

$$Y = a + bx \quad (2)$$

where:

Parameter a: intercept

Parameter b: slope

Next, parameters a and b can be found using the formula:

$$a = \frac{\sum yi - b\sum xi}{n} \quad 3$$

$$b = \frac{n\sum xiyi - \sum xiyi}{n\sum x^2 i - (\sum xi)^2} \quad 4$$

where:

x: Catching effort during i-period

y: Catches per unit effort in the i-period

After knowing the values of a and b, then estimating sustainable potential (MSY) from the catch data and catching effort (Fopt) Irian Arwana Fish carried out using the Fox model (Pauly, 1983).

1. Fox Model (Exponential Model):

a. Relationship between fishing efforts and catch results per unit effort:

$$CPUE = \exp(a + bf) \quad (5)$$

a and b are respectively natural antilogarithms (ln) of intercepts or regression coefficients of the relationship between ln CPUE and capture attempts which are linear relationships. Using equation (5), the relationship between effort and catch is:

$$C = f \exp(a+bf) \quad (6)$$

b. The optimum catching effort (fopt) is obtained by equating the first derivative of the catch to the catch effort equal to zero

$$fopt = -(l/b) \quad (7)$$

B is the anti-regression coefficient of the relationship between CPUE and capture efforts. The maximum sustainable catch (MSY) is obtained by substituting the optimum capture effort value in equation (7) so that it is obtained:

$$MSY = -(1/b)\exp(a-1) \quad (8)$$

3. RESULTS AND DISCUSSION

Based on the results of interviews with fishermen on the Wanggo River that, the local community carried out Irian Arwana fishing using the gill net, with sizes of 4 - 4.5 cm, while for the reproduction of one parent Arwana Irian ranged from 50 to 65 with a size length of 6 - 8 cm, this is equivalent to that explained by Satria et all., (2007) that the results of experiments with experimental gill net obtained for one parent can produce 50 puppies.

The Arwana Irian fish caught by fishermen on the Wanggo river is carried out from the second week of November to the first week of February. This is equivalent to that explained by Satria et all., (2014), that fishing activities in 2014 - 2015 were peak in mid-December and ended until February or many Irian Arwana fishing was carried out during the rainy season.

The characteristics of Arwana Irian fish habitat on the Wanggo river are river banks that have vegetation of aquatic plants and fallen tree branches. This is in accordance with that explained by Satria et all., (2014), Characteristics of Arwana Irian habitat on the Maro River, visually generally favoring places where there are grasses, trees and submerged shrubs found on the banks of rivers.

The graph of the production of Irian Arwana Fish on the Wanggo River in the Erambu Village of Sota District in 2008 - 2017 which is processed based on secondary data can be seen in Figure 2.

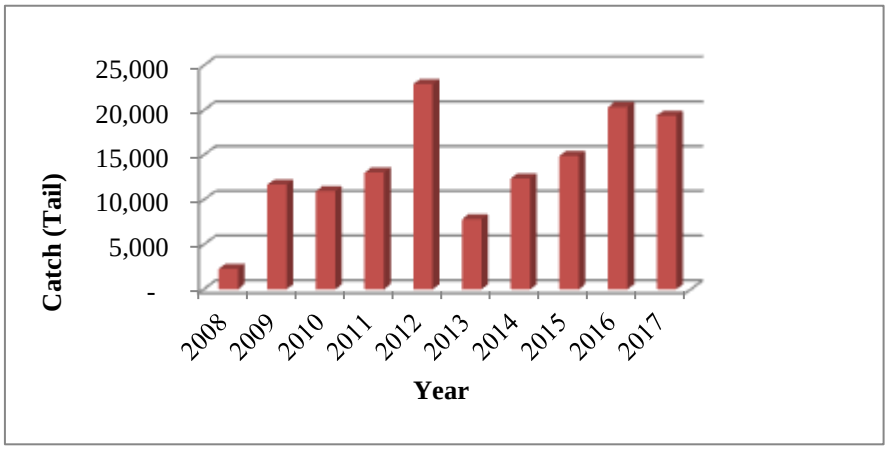

Figure 2. Production of Irian Arwana (*Scleropages jardinii*) on the Wanggo River in Erambu Village in 2008-2017

Figure 2 above shows that the catch obtained in 2012 was higher or greater at 22,916 compared to other years, as well as for 2008 the lowest number of catches was 2,266 compared to other years. Low height or the ups and downs of production or catch are caused by various factors, namely, fishing efforts, fishing season, fishing gear and market demand.

The estimated potential of Arwana Irian fish resources on the Wanggo River in Erambu Village is done by analyzing catch data and catching efforts. The results obtained from the estimation are the maximum number of catches allowed so that the availability of fisheries resources, especially Arwana Irian, is sustainable or sustainable (Table 1).

Table.1 Data on Production of Arwana Irian (*Scleropages jardinii*) on the Wanggo River

Year	Catch (ekor)	Effort standar (F)	CPUE
2008	2,266	8	283.25
2009	11,666	41	284.54
2010	10,959	39	281
2011	13,019	46	283.02
2012	22,916	82	279.46
2013	7,826	28	279.50
2014	12,367	44	281
2015	14,900	53	281.13
2016	20,352	73	278.79
2017	19,394	69	281.07

Table 1 shows that the number of catches of Arwana Irian fish on the Wanggo River in Erambu Village in 2008 was 2,266. In 2009 there was an increase of 11,666 tails probably due to the increase in effort. In 2010 there was a decrease in the number of production by 10,959 tails when compared to the previous year, which was in 2009. In 2011 there was an increase of 13,019 tails if compared to 2010 this might be due to an increase in hauling (effort). In 2012 there was an increase in Arwana Irian catch (catch) production of 22,916, this is probably due to the increase of hauling (effort) exceeding previous years which amounted to 82 trips. In 2013 there was a decline in the number of production by 7,826, possibly due to a decrease in the number of hauling (effort) of 28 trips compared to 2012. In 2014 there was an increase in catch production of 12,367, then in 2015 there was a catch of production increase of 14,900 over the year 2014. In 2016 there was an increase in the number of catches production by 20,352 when compared with 2013-2015, the possibility of an increase in the effort of catching (effort) of 73 trips and in 2017 experienced a slight decline of 19,394 when compared to 2016. This is equivalent to Melmambessy (2010) In 2007 there was an increase in tuna catches of 6,139.6 tons, and this catch exceeded previous years (1999-2006) this was probably due to an increase in the number of trips or efforts of 148,747, 7540. This is also explained by Suhaeti (2002) that many fish catch fluctuations are influenced by several factors, including the presence of fish, the number of fishing attempts and the success rate of fishing operations.

With the catch value (number of catches) and effort (catching effort), the CPUE value can be obtained by catching divided effort (Table 2), from the table the lowest CPUE value is found in 2010 and 2014 with 281 head / trip, CPUE decreasing due to the lack of effort and catch, the highest number was found in 2009 amounting to 284.54 fish / trip, the increase in CPUE value was due to the increase in effort and catch. This is equivalent to Nugraha et all., (2012) which states that the addition of catching efforts that are not followed by an increase in the number of catches will result in a decrease in CPUE.

When compared to the catch data in table 1 above with the MSY value of the Scheafer model and the Fox model in Table 2 below, the allowable amount of catch (tail) and effort (Trip) is obtained.

Table 2. Sustainable Potential and Optimum Effort of Irian Arwana Fish (Scleropages jardinii) on the Wanggo River in Kampung Erambu in 2008-2017 based on the Fox method

No	Nilai	Fox	Satuan
1	a	5.647	
2	b	-0.0002	
3	MSY	521.358	Ekor
4	F_{opt}	5000	Trip
5	R^2	0.2858	

From Table 2, the above can be seen the value of a simple regression equation with values a and b, also shown the value of MSY, Fopt and R2 based on the Fox model, to be more clear the MSY and Fopt graphs by calculation based on the Fox model can be seen in Figure 3.

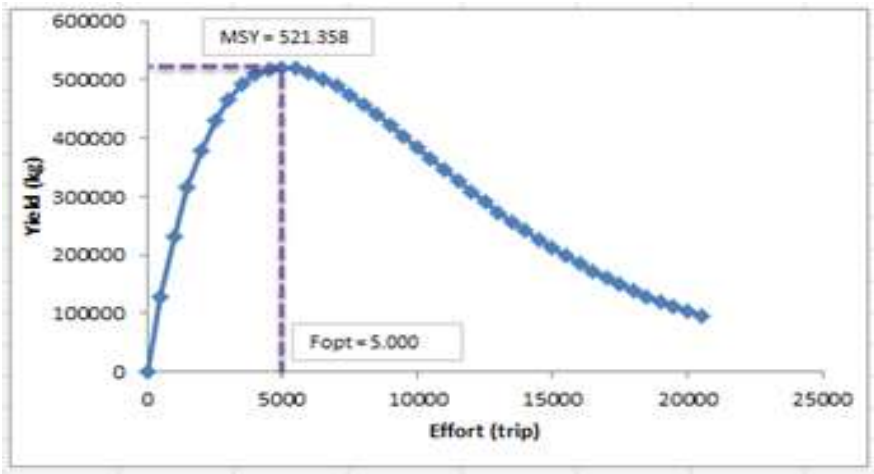

Figure 3. MSY Graph and Fox Optimum Model Effort

The MSY and Fopt garf for the Fox model (Figure 3) above shows that the potential stock of Irian Arwana fish (Scleropages jardinii) in the Wanggo River with MSY = 521,358 tails with Fopt = 5000 trip.

The relationship between the value of MSY and Fopt for the Fox Model model (Figure 3) occurs a balance between the catch and catch (catch), but for the Wanggo River the potential stock of Irian Arwana fish (Scleropages jardinii) in 2008-2017 has not reached the MSY value and Fopt, so it can be said that the catch and catching effort are still under fishing. This is equivalent to that explained by Sentosa and Satria (2015) that although the rate of exploitation of ray wader fish has not reached its optimum value, the Precautionary approach still needs to be applied so that overfishing phenomena do not occur. According to (Gulland, 1971) The optimum rate of exploitation occurs if there is a balance between the ratio M and F so that it is assumed that the optimum value of exploitation (EOPT) is equal to E = 0.5.

The Fox Model calculation model above when connected with the R2 value, the Fox model can be used as a standard for determining Arwana Irian fish stocks on the Wanggo River in Erambu Village, with MSY = 521,358 with Fopt = 5000 trip. This is equivalent to Melmambessy (2010) and Widodo et all., (2016) that the value of R2 used as the

determination of the standard MSY and Fopt is Fox model because the value of R2 = 0.666 or close to number 1 (meaning that the closeness between production and effort is stronger)

According to Imron (2010) based on the allowed catch amount (JTB), resources that can be captured are 80% of the potential that exists. The number of permissible catches (JTB) of Irian Arwana fish on the Wanggo River in Erambu Village, Sota District is 80% from the value of MSY = 521,358 which is 417,087 tails, therefore catch or catch and fishing efforts can be increased for more results as long as it does not exceed the MSY limit and Fopt specified.

4. CONCLUSION

1. Maximum Sustainable Yield of Arwana Irian fish on the Wanggo River in Erambu Village, Sota District, Merauke Regency based on the calculation of the Fox model is 521,358 with Fopt being 5000 trips.

2. The Arwana Irian fish stock in the Wanggo River is classified as under fishing because the catch and effort efforts have not yet passed the total MSY and Fopt, so fishing efforts can still be carried out, while maintaining the specified MSY and Fopt limits .

REFERENCES

[1] Allen, G.R.1991. Field guide to the Freshwater Fishes of New Guine. Cristense Research Institute. PNG

[2] Fachrul. 2008. Metode Sampling Bioekologi. Penerbit: Bumi Aksara. Jakarta

[3] Gulland, J.A. 1971. The Fish Resources of the Oceans. FAO Fishing News (Books) Ltd. Surrey:255p

[4] Gulland, J.A. 1983. Manual of methods for stock assessment.FAO Rome.

[5] Helfman, G.S., B.B Collete & BB Facey, 1997. The diversity of fishes. Blackwell Scietific.528

[6] Hidanah, S., Nazar, D.S., Supranianondo, K., Sidik, R., Mangkoedihardjo, S. 2016. Volatile fatty acids and ammonia levels in local sheep's rumen fluid fed with fermented rice straw. International Journal of Engineering and Technology, 8(2): 1324-1328.

[7] Imron, M. 2000. Stock Bersama dan Pengelolaan Sumberdaya Ikan di Wilayah Perairan Indonesia. Buletin PSP,Vol IX. No. 2. Oktober 2000, Jurusan Pemanfaatan Sumberdaya Perikanan , Fakultas Perikanan dan Ilmu Kelautan, Institut Pertanian Bogor. Hal 41-52.

[8] Kotta H., Mangkoedihardjo, S., Ludang, Y., Trisutomo, S. 2018. The design of riparian zone in waterfront area of Tanjung Bunga, Makassar. International Journal of Civil Engineering and Technology, 9(8): 580–584.

[9] Kottelat, M,A.JWhitten,S.N Kartikasari & S.Wijoatmodjo.1993. Ikan air Tawar Indonesia Barat dan Sulawesi.Periplus Edition. Hongkong.344p

[10] Melmambessy. 2010. Pendugaan Stok Ikan Tongkol di Selat Makassar Sulawesi Selatan. Jurnal Ilmiah agribisnis dan Perikanan (agrikan UMMU-Ternate). Vol 3 (1) : 53-61

[11] Nugraha E, Koswara B, dan Yuniarti 2012.Potensi Lestari dan Tingkat Pemanfaatan ikan Kurisi (Nemipterus japonicas) di Perairan Teluk Banten.

[12] Pauly, D. 1983. Some Simple Methods for the Assessment of Tropical Fish Stocks. FAO Fisheries Technical Paper (254): 52p.

[13] Satria H, & D.W.H Tjahjo, 2007, Ikan Hias Nusantara: Pengelolaan Sumberdaya Ikan Arwana Irian Di Sungai Maro Melalui Upaya Konservasi Untuk Pemanfaatan yan Berkelanjutan. Pusat Riset Perikanan Budidaya .69-78

[14] Satria H, Sentosa A.A dan Satria F, 2014, Kajian Karakteristik Habitat dan Kelimpahan Stok Ikan Arwana Irian Di Sungai Maro, Kumbe, dan Kimaam Kabupaten Merauke – Papua.

[15] Satria, H., E.S. Kartamihardja, R.P. Prahoro,A. Rahman, A.A. Sentosa & U. Sukandi. 2013. Pendekatan Ekosistem untuk Pengelolaan Populasi Ikan Arwana Irian di Sungai

Kumbe, Merauke, Papua. Laporan Teknis Pengembangan dan Penelitian. Balai Penelitian Pemulihan dan Konservasi Sumberdaya Ikan. Purwakarta. 48 hlm.

[16] Sugiyono. 2013. Metode Penelitian Pendidikan Pendekatan Kuantitatif, Kualitatif, dan R&D. Bandung: Alfabeta.

[17] Suhaeti. 2002. Pendugaan Potensi Lestari dan Tingkat Pemanfaatan Ikan Tembang (Sardinella fimbriata) di Perairan Teluk Banten. Skripsi. Jurusan Perikanan Fakultas Pertanian Jatinangor. 56 pages.

[18] Untari, Edy H.P Melmambessy, and David Oscar Simatupang. 2018. Carbon Emissions And Mitigation Actions In Merauke. E3S Web of Conferences 73, 02009 (2018).

[19] Untari, Yus Witdarko, and Jefri Sembiring. 2018. Analysis Of Carbon Emission Level on Merauke Regency Land Cover. E3S Web of Conferences 73, 08013 (2018).

[20] Widodo M.H, Edy H.P Melmambessy, Siti Masiyah, 2016. Potensi Ikan Kakap Putih (Lates calcarifer Bloch, 1790) di Sungai Kumbe Distrik Malind Kabupaten Merauke. Jurnal Agricola, Vol 6 (1) : 31-39

[21] Yus Witdarko, Philipus Betaubun, and Jayadi. 2018. Relationship modelling between moisture content of flour and variables of two-cycle drying process of cassava flourusing pneumatic dryer. E3S Web of Conferences 73, 05014 (2018).