Comparison of water quality and its influences on phytoplankton abundance based on water characteristics in coastal of Banyuwangi Regency, Jawa Timur, Indonesia

by Endang Dm

Comparison of water quality and its influences on phytoplankton abundance based on water characteristics in coastal of Banyuwangi Regency, Jawa Timur, Indonesia

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Abstract. Coastal waters of Banyuwangi Regency, East Java, Indonesia obtains water resources from residential areas, the fishing industry, the shipping industry in the surrounding area. This study aims to determine the influences of water quality on phytoplankton abundance, seen from differences characteristics of coastal waters of Banyuwangi. The research method is descriptive. Data collection technique is observation, with the required data including water quality parameters (Sn, PO_4, Total Organic Matter, NO_3, Cu Copper, DO, Water Temperature, Pb, Salinity, pH, and NH_4) and phytoplankton. The analysis used plankton abundance analysis calculated using the Lachlan modification formula (1982), and multiple regression analysis. The analysis result showed that the type of phytoplankton found was green algae *Chlorella* type and blue-green algae *Oscillatoria* type. The abundance of phytoplankton in the coastal area of Banyuwangi is around 12.5 - 513.75 ind/L, where it is included in the level of eutrophic phytoplankton abundance, which waters in a high fertility. There is an influence between water quality on the abundance of phytoplankton on the coast of Wongsorejo, Banyuwangi and Blimbingsari Districts. Whereas in Lampon (Pesanggaran subdistrict), water quality does not affect the abundance of phytoplankton.

1. Introduction

Coastal water has an important role in the marine aquatic ecosystem. However coastal water is easily influenced from terrestrial input from various sources to the ocean [1]. Fertile waters can certainly support the diversity of available biota resources. Aquatic fertility can be indicated by the abundance of available phytoplankton. Changes of water quality can be seen from the abundance and composition of phytoplankton. The presence of phytoplankton in a waters can provide information about water conditions. Even some studies use the phytoplankton ecological index as an indicator of pollution or trophic levels [2]. This may lead to changes in primary productivity in marine aquatic ecosystem.

1

Changes in primary productivity have been causally linked to the nutrient status of the aquatic ecosystem for over a century. Phytoplankton production is usually dependent upon supplies of Nitrogen (N) and Phosphate (P) to natural water [3].

Plankton is a living organism that floats in water. This organism has a very limited ability to move, so the distribution of these organisms is influenced by water flow conditions. Plankton can be divided into two namely phytoplankton (plant plankton) and zooplankton (animal plankton). Plankton (phytoplankton and zooplankton) have a very large role in aquatic ecosystems because it is a food source for other aquatic animals. The distribution of phytoplankton is influenced by the availability of light in waters or scattered within the euphotic zone. The ability to form organic substances from inorganic substances in water makes phytoplankton known as primary producers [4].

In the food chain (tropical level), phytoplankton occupies the lowest position as the main food source for aquatic animals. It can be said that waters with high phytoplankton primary productivity will have great biological resource potential [5]. Sharmila and Narayanan [6] explained that phytoplankton contributes 90% of photosynthesis in marine water whose production is mostly coupled to the foremost taxonomic groups including *Diatoms, Dinoflagellates, Coccolithosphores* and *Silicoflagellates*.

Many coastal and inland water systems have been increasingly polluted due to the influence of domestic and industrial waste discharges, high quantity of agro-materials in agricultural runoffs, proliferation and rapid growth of algal blooms (including harmful algal blooms), sediment discharge from floods and rivers, and increased human settlement and encroachment [7]. Coastal of Banyuwangi Regency is the longest coast in East Java which is 75.8 km, including facing the Indonesian Ocean, some facing the Bali Strait and even the Gulf. In the era of industrialization, the coastal area in Banyuwangi Regency was the top priority for industrial development, agribusiness, agro-industry, housing, transportation, ports, and tourism. Increased use of waters as a means of various kinds of community activities can cause changes to these factors. Then the presence and activity of phytoplankton are related to the surrounding aquatic environment [8].

Based on that, the purpose of this study is to compare water quality and its effect on the abundance of phytoplankton based on the characteristics of the waters off the coast of Banyuwangi Regency.

2. Material and methods

Table 1. Observed Aquatic Environment Parameters and Tools/Measurement Methods.

Parameter	Tools / Methods	Information
Biology		
1. Phytoplankton	Haemocytometer	Laboratory Analysis
Water quality		
1. Dissolved oxygen	DO meter/Winkler	Insitu/Laboratory
2. Salinity	Salinometer	Insitu
3. pH	pH meter	Insitu
4. TSS	Spectrophotometer	Laboratory Analysis
5. Amonia	Spectrophotometer	Laboratory Analysis
6. Nitrat	Spectrophotometer	Laboratory Analysis
7. Phosphate	Spectrophotometer	Laboratory Analysis
8. Temperature	Termometer	Insitu
9. Heavy Metal	Spectrophotometer	Laboratory Analysis

Plankton abundance [12] is calculated using the following formula:

$$N = n \; x \; \frac{Vr}{Vo} \; x \; \frac{1}{Vs}$$

Annotation:

N	=	Number of individual plankton (ind / L)
n	=	Number of plankton observed
Vr	=	filtered plankton volume (ml)
Vo	=	observed plankton volume (ml)
Vs	=	volume of filtered water (L)

The next analysis is multiple regression analysis. Regression analysis is performed to determine whether the independent variable, namely water quality, can affect the abundance of phytoplankton (variable bound). The F Statistical Test basically shows whether all independent variables or independent variables entered in the model have an influence together on the dependent variable or the dependent variable. To test this hypothesis F statistics are used with the following decision-making criteria:

- If the regression results on ANOVA significance value is more than the value of confidence 0.05 in other words, we reject the hypothesis, which states that all independent variables simultaneously do not affect the dependent variable.
- It says the hypothesis can be accepted if the significance value is less than the degree of trust sig. 0.05. The hypothesis is accepted, meaning simultaneously all the independent variables affect the dependent variable [12].

The T-test is performed to find out the coefficient of the results of data analysis, and then also can be seen in the multiple linear regression equation. In multiple regression, there is a free variable that is associated with linear Y [13]. If the independent variable x1, x2, ... xk and the independent variable Y, then the general form for multiple regression can be expressed in the equation:

$$Y = a + b_1X_1 + b_2X_2 + ...b_kX_k$$

notation :

Y	=	Dependent Variable (Phytoplankton)
X1, X2, X3, ...	=	Independent Variable (Water Quality: DO, Temperature, pH, Salinity, NH_4, NO_3, PO_4, CO_3, HCO_3, TOM)
a	=	Intercept
b1, b2, b3 ...	=	slope (slope of the line / curve)

The value of determination or R^2 which serves to predict whether or not the influence of independent variables on the dependent variable is needed. A small R2 value means that the ability of the independent variables to explain the variation of the dependent variable is very limited. A value close to 1 means that the independent variables provide almost all the information needed to predict the dependent variation [14].

3. Result and discussion
3.1. Coastal waters of Banyuwangi Regency
The coast of Banyuwangi Regency is located along nine subdistricts, except that in this study the chosen location is six sub-districts which have brackish cultivation activities. And the six districts have different water characteristics. From the northernmost direction, there is the coast of Wongsorejo District, were along the coast there are many intensive brackish cultivation activities. The coastal waters of Wongsorejo Subdistrict are waters that face the Bali Strait directly and are quite influenced by the Java Sea waters, while the bottom waters along the coast are coral and sandy.
To the south, there is the coast of Banyuwangi Subdistrict, which has sandy and muddy waters and directly faces the Bali Strait. In addition, there are also coastal vegetation, namely mangrove, and fir. Likewise, the coastal waters of Blimbingsari Subdistrict are not much different from the waters on the coast of Banyuwangi Subdistrict, both directly dealing with the Bali Strait and the bottom waters are

sandy. It's just that on the coast of the Blimbingsari District there are no mangroves or other coastal vegetation that serves to protect the beach from abrasion, so the waves are higher than on the coast of Banyuwangi.

Next, there are Pangpang Bay waters which are included in the administration of Muncar and Tegaldlimo Subdistricts. In this coastal waters, the characteristic differ from other waters because it is a waters of the bay along the coast there are mangrove vegetation with mud bottom.

Towards the southernmost, there are the coastal waters of Pesanggaran District, in this case entering the Lampon area precisely close to the overlapping gold mine. In this parade directly faced with the south coast precisely the Indian Ocean, so the characteristics are clearly different from other coastal districts.

Based on the explanation above, from the six coastal districts which have brackish cultivation activities, there are three water characteristics, which face directly to the Bali Strait are Wongsorejo, Banyuwangi, and Blimbingsari Districts, which face directly to the bay are Muncar and Tegaldlimo Districts and those that face directly with the Indian Ocean is Pesanggaran District (Lampon).

3.2. Coastal Water Quality in Banyuwangi Regency
Environmental parameter data taken are water quality in the form of temperature, salinity, pH, DO, NH4, NO3, PO4, Alkalinity (CO3, HCO3) and TOM in the coastal waters of Banyuwangi Regency with three replications.

Table 2. Water Quality Data on Coastal Waters of Banyuwangi

Water Quality / Research Site	DO	Water Temperatur	Water pH	Salinity	NH$_4$ (ppm)	NO$_3$ (ppm)	PO$_4$ (ppm)	Alkalinity CO$_3$ (ppm)	HCO$_3$ (ppm)	TOM
Coastal District of Wongsorejo	6.90	28.95	7.25	22.67	0.00	0.17	0.03	20.67	120.67	6.90
Coastal District of Banyuwangi	7.12	30.02	7.70	25.50	0.00	0.00	0.02	35.33	102.67	7.12
Coastal District of Blimbingsari	6.25	30.2	8.65	27	0	0	0.1	12	130	6.25
Coastal District of Muncar & Tegaldlimo (Pangpang Bay)	3.97	29.735	6.45	20.5	0.75	0	0	24	107	3.97
Coastal District of Pesanggaran (Lampon)	6.85	30.65	7	25.5	0	0	1.5	44	82	6.85

Based on observations of temperature at the study site in the range $28{,}95^0$C - $30{,}65^0$C these waters can be classified as waters with normal temperatures for tropical waters. This is, the normal temperature in the tropics ranges from 23^0C - 32^0C [14].

Dissolved oxygen in these waters is in the range of 3.97 - 7.12 mg / L, so that the waters at the study site are above the minimum dissolved oxygen requirement of 5 mg / L. The content of dissolved oxygen in a waters has a minimum requirement of dissolved oxygen which is a minimum of 5 mg / L [15].

The pH value at the six stations ranges from 6.45 to 8.65, this shows that the pH level in the coastal waters of Banyuwangi Regency is still in the normal range. While the average pH of seawater varies, although not too large, ranging from 7.8 to 8.4 [16], and seawater, in general, has a pH ranging from 7.6 to 8.3 [17].

Salinity in the coastal waters of Banyuwangi District is classified as normal salinity with a range of 25-27 ppt. While salinity in seawater ranges from 24-35 ppt. The distribution of salinity at sea is influenced by various factors such as water circulation, evaporation, rainfall, and river flow [4].

The nitrate content at the sampling point was obtained in the range 0.8 -5 mg / L. The nitrate content in the coastal waters of Banyuwangi District, comes from the river flow in the research location and also comes from the existing shrimp farming ponds. According to the Decree of the Minister of Environment in 2004 this value indicates that the nitrate content is above the quality standard threshold (0.008 mg / L) which means that the nitrate content in the coast of Banyuwangi Tinggi District.

The phosphate contained in this study site is sourced from streams, household waste, and the aquaculture industry. The range of phosphate in the waters is between 0.1-1.75 mg / L, which means that the phosphate content in the coastal waters of Banyuwangi District is above the standard threshold of phosphate (0.015 mg / L). This value according to the Decree of the Minister of Environment in 2004 has also been above the quality standard threshold (0.015 mg / l) which means that the phosphate content at this research site is in an abnormal condition.

3.3 The abundance of phytoplankton on the coast of Banyuwangi Regency

Based on the results of observations made, the type of phytoplankton found was green algae Chlorella type and blue-green algae Oscillatoria type. While the abundance of phytoplankton abundance on the coast of Banyuwangi Regency ranges from 12.5 - 513.75 ind / L. for trophic status of waters, the abundance of phytoplankton in the coastal waters of Banyuwangi Regency is included in the level of Eutrophic phytoplankton abundance, namely waters with high fertility due to phytoplankton abundance of> 15,000 ind / ml [18].

Table 3. Phytoplankton Data in the Coastal Waters of Banyuwangi

Research Site	Phytoplankton (ind/L)
Coastal District of Wongsorejo Wongsorejo	94.286
Coastal District of Banyuwangi	96.25
Coastal District of Blimbingsari	20
Coastal District of Muncar & Tegaldlimo (Pangpang Bay)	12.5
Coastal District of Pesanggaran (Lampon)	513.75

Based on the table above, the abundance of phytoplankton in each coast there is a difference. The Pangpang Bay coast has the lowest abundance of phytoplankton and is classified as moderate or Mesotrophic fertility, while the coast of Pesanggaran District (Lampon) has the highest abundance or Eutrophic.

3.4 Effect of Water Quality on Phytoplankton Abundance

Regression analysis was performed using water quality and phytoplankton data which were divided according to the characteristics of the waters that exist in the coastal areas of Banyuwangi. Based on the results of multiple regression analyses conducted between water quality including Sn, PO4, TOM, NO3, Cu, DO, Water Temperature, Pb, Salinity, Alkalinity, pH, NH4 regressed to plankton abundance, the results did not all affect. This shows the difference in water characteristics along the coast of Banyuwangi is indeed quite different.

The influence of water quality on plankton abundance on the coast of Banyuwangi District is shown by the results of multiple regression analysis stating a significant value between water quality and phytoplankton abundance. Thus it can be seen that the abundance of phytoplankton in waters requires water quality conditions that are in accordance with the life of phytoplankton.

The coast of Banyuwangi Regency which is divided into three water characteristics, namely the coast facing the Bali Strait waters, Pangpang Bay waters, and the Indian Ocean waters, from the results of multiple regression analysis between water quality and abundance of phytoplankton, there is an influence only in coastal waters facing the Bali Strait while those in the Gulf and Ocean there is no influence.

Based on the regression analysis, it can be concluded that there is an influence between water quality on the abundance of phytoplankton on the coast of Wongsorejo, Banyuwangi and Blimbingsari Districts.

Table 4. Model Reliability Test (Test F) Effect of Water Quality on Phytoplankton Abundance in Wongsorejo District, Banyuwangi, Blimbingsari.

Model		Sum of Squares	df	Mean Square	F	Sig.
	Regression	95896510802,904	12	7991375900,242	3,056	0,018[b]
1	Residual	44450155863,763	17	2614715050,810		
	Total	140346666666,667	29			

a. Dependent Variable: Phytoplankton abundance.
b. Predictors: (Constant), Sn, PO4, TOM, NO3, Cu, DO, Water Temperature, Pb, Salinity, Alkalinity, pH, NH4.

Probability value of calculated F (Sig.) In the table above is 0.018 less than the 0.05 significance level so that it can be concluded that the estimated linear regression model is suitable to explain the effect of Sn, PO4, TOM, NO3, Cu, DO, Water Temperature , Pb, Salinity, Alkalinity, pH, and NH4 on the value of phytoplankton abundance.

R-Square value of 0.683 indicates that the proportion of the influence of Sn, PO4, TOM, NO3, Cu, DO, Water Temperature, Pb, Salinity, Alkalinity, pH, and NH4 effects on plankton abundance is 68.3%. That is, the values of Sn, PO4, TOM, NO3, Cu, DO, Water Temperature, Pb, Salinity, Alkalinity, pH, and NH4 have a proportion influence on plankton abundance values of 68.3% while the remaining 31.7% (100% - 68.3%) influenced by other variables that are not in the linear regression model.

Interpretation of Phytoplankton Abundance Models
= 3,066,802,015 + 108,661,536 DO - 86,605,472 Water Temperature + 229,970,744 pH + 33,989,462 Salinity + 11,012,326,291 NH4 + 17,896,347 NO3 + 442,010,745 PO4 - 9,322,343 Alkalinity - 42,351,992 TOM + 8,328,287,487 Copper (Cu) - 19,748,422,962 Lead (Pb) - 325,178,776 Tin (Sn)
Viewed from the oceanographic aspect, the Bali Strait is one of the important waters in the circulation of water masses in Indonesia. The dynamics of its water mass are influenced by the flow of two main water masses, namely the Java Sea water mass in the north and the Indian Ocean water mass in the south. Mixing the two water masses has a positive impact on the quality of the Bali Strait water mass, among others, affecting the nutrient content (nutrients). The waters of the Bali Strait are highly dynamic waters and are influenced by current systems in the Java Sea and the Indian Ocean. Sea currents in the waters of the Bali Strait are bidirectional currents or ocean currents moving in and out of the strait. Changes in the elevation of water levels at both ends of the strait cause currents to move in two opposite directions [18]. While strait waters are hydraulic type currents because the strait connects two bodies 0of water that are affected by tides that are not interconnected. Based on this, the waters of the Bali Strait have a high enough role in the upwelling process so that they affect the abundance of phytoplankton [19]
Further regression analysis can be concluded that water quality has no effect on plankton abundance in Pangpang Bay which is incorporated in the coast of Muncar and Tegaldlimo Districts.
Probability value The calculated F (Sig.) In the Table above values 0.225 is greater than the 0.05 significance level so that it can be concluded that the linear regression model estimated is not feasible to use to explain the influence of Sn, PO4, TOM, NO3, Copper Cu, DO, Water Temperature, Pb, Salinity, Alkalinity, pH, and NH4 to the value of plankton abundance.
Subsequent regression analysis can also be concluded that water quality does not affect the abundance of phytoplankton in Lampon (Pesanggaran District).

Table 5. Model Reliability Test (Test F) Effect of Water Quality on Phytoplankton Abundance on the Lampon Coast (Pesanggaran District).

Model		Sum of Squares	df	Mean Square	F	Sig.
	Regression	2476465000000,001	5	495293000000,000	1,072	,487[b]
I	Residual	1847362500000,000	4	461840625000,000		
	Total	4323827500000,001	9			

a. Dependent Variable: Phytoplankton Abundance

b. Predictors: (Constant), Sn, PO_4, TOM, NO_3, Cu, DO, Water Temperature, Pb, Salinity, Alkalinity, pH, dan NH_4

Probability value of calculated F (Sig.) in the above table is 0.487 greater than the 0.05 significance level so that it can be concluded that the linear regression model estimated is not suitable to be used to explain the effect of Sn, PO_4, TOM, NO_3, Cu, DO, Water Temperature, Pb, Salinity, Alkalinity, pH, and NH_4 on the value of phytoplankton abundance.

Closed waters are waters that are blocked by land or islands in front of it or in the form of bays. So that the strength of the currents and waves will decrease when they arrive at the beach. Closed waters are usually mostly formed from the composition of sand, mud or silt resulting from sedimentation or sedimentation, usually located near river mouths. Mud has more complex substance than sand and has higher organic matter. The mud itself consists of sand, but the more important material is silt and clay whereas, good mud sediment can only be formed on the basis of low wave movement or deeper location so that the waves are not too affected [21].

Based on table 3, for all coastal waters of Banyuwangi Regency, they are included in Eutrophic waters or high phytoplankton abundance, except Pangpang Bay coast which has an abundance in the medium category or is called Mesotrophic, the abundance level is around 2,000 - 15,000 ind / ml, while Pangpang Bay is as much as 12,500 ind / ml.

That is because of all the coastal waters in Banyuwangi Regency, only Pangpang Bay which is a closed waters is different from other waters that enter the open waters so that greater water circulation. This is the cause of the bay waters easily heat faster. Where the light is too strong intensity will damage chlorophyll in a reaction called photo-oxidation [21].

For coastal areas in Pesanggaran subdistrict, the abundance of phytoplankton is indeed quite high compared to other coastal waters in Banyuwangi Regency, because it is dealing directly with the Indian Ocean, where the upwelling process that occurs at this location is also quite high, which is the movement of water mass from the inner layer that rises to the surface . The mass of water from the inner layer has lower temperatures and higher salinity than the surface layer. Because of the magnitude of this upwelling process which then stirs the nutrients in the bottom waters up so that it becomes sufficient intake in the growth of phytoplankton.

However, the quality of water available in the coastal areas of the Ocean does not affect the abundance of phytoplankton, given the strong currents from the Indian Ocean that cause high waves compared to other coasts in Banyuwangi.

4. Conclusion

Based on the results of the analysis it was concluded that the type of phytoplankton found was green algae *Chlorella* type and blue-green algae *Oscillatoria* type. While the abundance of phytoplankton abundance in the coastal area of Banyuwangi is around 12.5 - 513.75 ind / L, where the abundance of phytoplankton is included in the level of eutrophic phytoplankton abundance, namely waters with high fertility. Based on the subsequent analysis of regression analysis, there is an influence between water quality on the abundance of phytoplankton on the coast of Wongsorejo, Banyuwangi and Blimbingsari Districts. Whereas in Lampon (Pesanggaran subdistrict) it can be concluded that water quality does not affect the abundance of phytoplankton.

5. References

[1]   Nazmi SM, Mustapha A M and Lihan T 2013 *World Appl Sci J*. **21**, 879-887

[2]   Karydis M and Tsirtsis G 1996 *Ecological Indeces: A Biometric Approach For Assessing Eutropication Levels In The Marine Environment. The Science Of The Environment*.**186**, 209-219

[3]   Smith V and Smith H 2006 Limnol. *Oceanography*. **51**, 377-384

[4]   Nontji A 2008 Plankton laut. *Pusat Penelitian Oseanografi*. Lembaga Ilmu Pengetahuan Indonesia (LIPI). LIPI Press p 331

[5]   Radiarta 2013 *Jurnal Bumi Lestar* **13**, pp 234-243

[6]   Zuazo VHD, Pleguezuelo CRR, Flanagan DC, Martinez JRF and Raya AM 2009 *Agricultural Runoff: New Research Trends. Agricultural Runoff, Coastal Enginering and Flood*. pp 27-48

[7]   Madubun 2008 *Produktivitas Primer Fitoplankton dan Kaitannya Dengan Unsur Hara dan Cahaya di Perairan Muara Jaya Teluk Jakarta*. Bogor: Institut Pertanian Bogor

[8]   Subana, et.al 2005 *Statistik pendidikan*. Bandung: Pustaka Setia

[9]   Nazir M 2010 *Metode Penelitian*. Ghalia Indonesia, Bogor

[10] Sachlan M 1982 *Planktonologi*. Semarang : Fakultas Peternakan dan Perikanan Universitas Diponegoro

[11] Ghozali Imam 2012 *Aplikasi Analisis Multivariate dengan Program IBM SPSS*. Yogyakarta: Universitas Diponegoro

[12] Sudjana 2005 *Metoda Statistika Edisi Ke 6*. (Tarsito: Bandung) p 508

[13] Ghozali, Imam. 2005. *Aplikasi Analisis Multivariate dengan SPSS*. Semarang: Badan Penerbit UNDIP

[14] Sastrawijaya 1991 *Pencemaran Lingkungan*. Bandung: Rineka Cipta

[15] Davis ML and DA Cornwell 1991 *Introduction to Enviromental Engineering Second Edition*. New York : Mc-GrawHill, Inc

[16] Brotowidjoyo MD, Tribawono dan E Mulbyantoro 1995 *Pengantar Perairan dan Budidaya Air*. Yogyakarta : Liberty Yogyakarta

[17] Landner 1978 *Eutrofication of Lakes : Causes Effects and Means for Control with Emphasis on Lake Rehabilitation*. World Health Organization

[18] Hernomo Arindri Diestya, Purwanto dan Jarot Marwoto 2015 *Jurnal Oseanografi*. **4**, 64 - 73

[19] Hadi S dan Radjawane IM 2009 *Arus Laut*. Institut Teknologi Bandung, Bandung

[20] Nybakken JW 1992 *Biologi Laut: Suatu Pendekatan Ekologis*. Gramedia: Jakarta

[21] Riyono SH 2007 *Oseana*. **XXXII**, 23 – 31

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