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Water Environment Pollution of Heavy metals Pb, Cd and Hg in Jepara Kartini Beach central Java, Indonesia

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Abstract

The objective of this research to calculate the concentration levels of Pb, Cd and Hg from the area of Kartini beach. These metal are very toxic for human and aquatic organism. This study was conducted in April 2015. The survey method used in this study. Presence of heavy metals than can be killed directly at very high concentrations, especially larval period, heavy metals can also be accumulated by aquatic organisms even in low concentrations in the water column. Accumulation of heavy metals in marine ecosystems is of global importance.

Keywords: Heavy metals pollution, Aquatic organism, Kartini beach.

Introduction

Heavy metals can come from pesticides, fertilizers, insecticides, industrial wastes, sewage domestic, workshop waste, road runoff, hospital waste and waste market[1]. Types of heavy metals studied in the waters of Kartini Beach is Cadmium, Lead and Mercury. They are always joined together as three heavy metal that has the highest level of danger to human health[2]. These heavy metals can cause health effects to humans when heavy metals are bound in the body. Owned toxicity would work as a barrier action of the enzyme, so that the body's metabolic processes disconnected. Furthermore, these heavy metals will act as allergens, mutagens, or carcinogens to humans. Entry point is through the skin, respiratory, and gastrointestinal. Each of these heavy metals have a negative impact on humans if consumed in large quantities for a long time[3]. The presence of heavy metals in the dangerous waters either directly to living organisms, as well as indirect effects on human health.

Research purposes: This study aims to determine the pollution content of heavy metals Cadmium, Lead and Mercury.

Methodology

The method used is survey method with quantitative descriptive nature. Measurements of heavy metals through water sampling include Cadmium, Lead and Mercury.

Determination of sampling points: Sampling points are determined based on a location close to the source of the activities that allegedly gave the pollution load to coastal waters include, sewage, effluent, urban storm water, tourism, shipping, fishing and aquaculture, In the study sample is taken to represent the environmental conditions that are the source of waste input into waters with purposive sampling method. Intake of water quality based on considerations of ease access, and the time which is expected to represent the research.

Station 1, the area is estimated as the entry of contaminants into the sea area as including estuaries Demaan, about the disposal of domestic waste and farm communities, meeting the drainage to the sea, and the fish market. Station 2, area is estimated as the entry of contaminants into the marine areas as intensive pond effluent, estuaries, household waste disposal and ferry ports Karimun Java islands. Station 3, the area is estimated as the entry of contaminants into the sea area as including estuaries outlet settlement Jepara Kartini beach tourism spot, plot transport boat tour of Long Island.

Tools and materials: The equipment used in this study such as: Global Positioning System, sampling bottles, plastic sample.

Laboratory analysis: Laboratory analysis was conducted at the Laboratory of Environmental Quality Testing Center for Industrial Pollution Prevention Technology Semarang central java-Indonesia.

Results and Discussion

Metal Lead Pb: Results of measurement of lead at all observation stations, has a range of values from 0.006 to 0.0089 mg / l. Pb compound derived from industrial emissions transport activity and then enter the water through crystallization in the air and fell through the rain[4]. Pb can be in the water body naturally and as a result of human activity. Elevated levels of lead in the water body come from motor vehicle exhaust emissions and industrial waste using Pb. That one of the main sources of income is a liquid metal into the waters of household waste[5]. Lead greatest value contained in the station station 1, this is because the station 1 as an estuary where there are ports trasional Demaan fishermen and a fairly dense residential area Demaan river flow. At the station 2 Lead originating source station runoff area station 2 community activities boat tour of Long Island, the port Pelni and trapped by the jetty or breakwater that prevents its spread. While at the station 3 Lead content is smaller due to fewer sources of pollution and possible spread by waves and ocean currents. Lead solubility in water can be derived from fuel used by fishing boats, which contains Lead (leaded gasoline), could contribute to the existence of Lead in the waters[6]. Aquatic biota such as crustaceans will die after 245 hours, when the body of water where the biota are dissolved at a concentration of 2.75-49 ppm Pb. While other aquatic biota, which are grouped in the class of insects will die within a longer time frame of between 168-336 hours, when the waters where his body dissolved 3.5-64 ppm[7]. The measurement results show that the station 1, and station 2 has been polluted exceeding the threshold value according to environment minister's decision states of republic Indonesia no 51 in 2004 was 0.008 mg / l.

Metal Mercury Hg: At the study site has a mercury content of 0.008 to 0.0015 mg / l. Metallic mercury could come from domestic garbage and degradation activities that produce leachate that flows into coastal waters. Leachate usually contains compounds - organic compounds as hydrocarbons, humic acid, sulfuric, land and error and inorganic as sodium, potassium, magnesium, phosphate, sulfate and heavy metal compound high. Heavy metals are often found in the leachate is arsenic, iron, cadmium, chromium, mercury, nickel, zinc, copper and lead[8]. Source of mercury waste pollution originating from settlements around Kartini Beach. A densely populated residential area has the potential to increase the concentration of heavy metals including mercury metal[9]. The value of the mercury contained in the station 1, this is because the station 1 as Demaan estuary where there is a fish market, floating market, trasional port as well as a fairly dense settlements along the watershed demaan. At the station 2 sources of mercury originating station runoff area station 1 and sewage settlements Kartini Beach. While at the station 3 mercury content lower tendency due to the source of pollution that goes into the waters had been scattered by the waves and ocean currents. Mercury compounds are toxic to fish and other aquatic biota because it can undergo biomagnification in the food chain. Organisms within the chain the highest (top carnivores) have higher levels of mercury than the organism below[10]. Amounting to 0.23-0.8 ppm Hg levels can be lethal to fish 96 hours of exposure[11]. The measurement results show that the station 1 and station 2 has exceeded the threshold value and the station 3, still below the threshold value or whether based environment minister's decision states of Republic Indonesia no 51 in 2004 of 0.001 mg/l.

Metal Cadmium Cd: Cadmium values at each measurement station 0,0009- range between 0.0013 mg / l. Metal Cadmium , into the waters as a result of human activities. In the study sites Cadmium is derived from domestic activities. Heavy metals Cd can be derived from, domestic waste, waste workshop, road runoff, hospital waste and waste markets. Cadmium can be dispersed in the environment through various sources including mining and industrial activities as well as the result of motor vehicle exhaust gas[12]. Heavy metals Cadmium is always joined together Lead and Mercury as the big three heavy metal that has the highest level of danger to human health. Cadmium greatest value contained in the station 1, this is because the station 1 as Demaan estuary where there is a dense residential area along the river flow Demaan. At the station 2 Cadmium source derived from household activities around coastal population Kartini and port activities and trapped by the jetty or breakwater that prevents its spread. While at the station 3 Cadmium content less tendency due to fewer sources of pollution that goes into the waters. In the body of water, the solubility of Cd in certain concentrations can kill aquatic biota. Biota classified nation crustaceans will die within an interval of 24-504 hours when in the water body where the living biota of dissolved metals or compounds of cadmium in the concentration range between 0.005 to 0.15 ppm. For biota which belong to the nation of insects will die within an interval of 24-672 hours when found in the water body where the living biota of dissolved cadmium compounds in the concentration range between 0.003 to 18 ppm. Whereas for biota waters belonging to the family of Oligochaeta will die within an interval of 24-96 hours when in the water body dissolved metals Cd or compounds with a concentration range between 0.0028 to 4.6 ppm[13]. Cadmium values measured at station 1 and station 2 has exceeded the threshold value is set according to environment minister's decision states of Republic Indonesia no 51 in 2004 of 0.001 mg/l.

Conclusion

Activities in coastal waters Kartini, such as the activity of the public toilets, the disposal of liquid waste from the surrounding community activities, waste fishing activity, the activity of fishing vessels, will have an impact on water quality degradation. Declining water quality is indicated by the presence of heavy metals Mercury, Lead and Cadmium has exceeded the threshold according to the environment minister's decision states of Republic Indonesia no 51 in 2004.

Suggestion: Government and society must continue to pursue the prevention of pollution.

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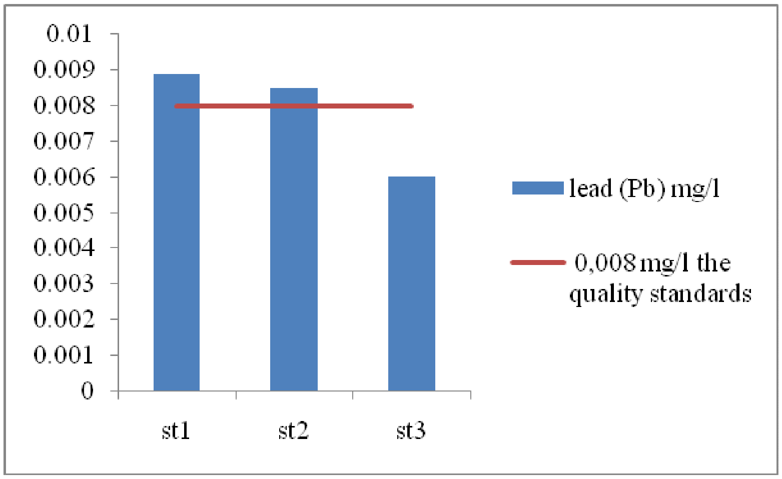

Figure-1
Value of Lead (Pb) (mg / l) at each location measurements

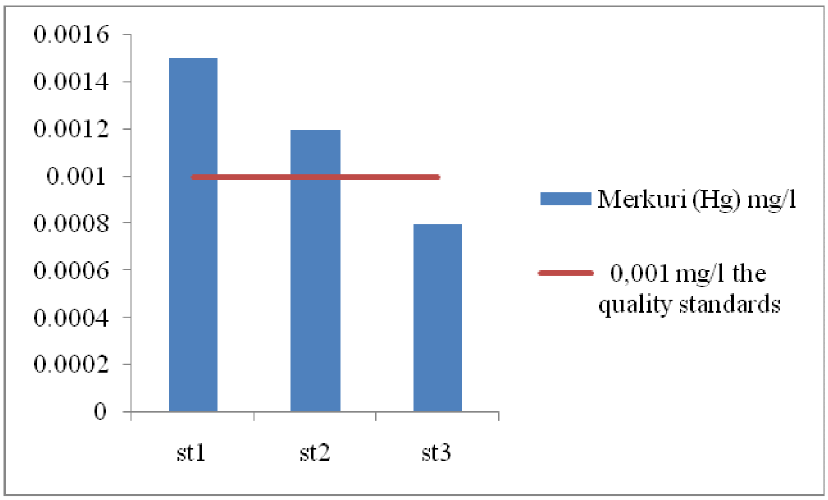

Figure-2
Value Mercury (Hg) (mg / L) at each location Measurement

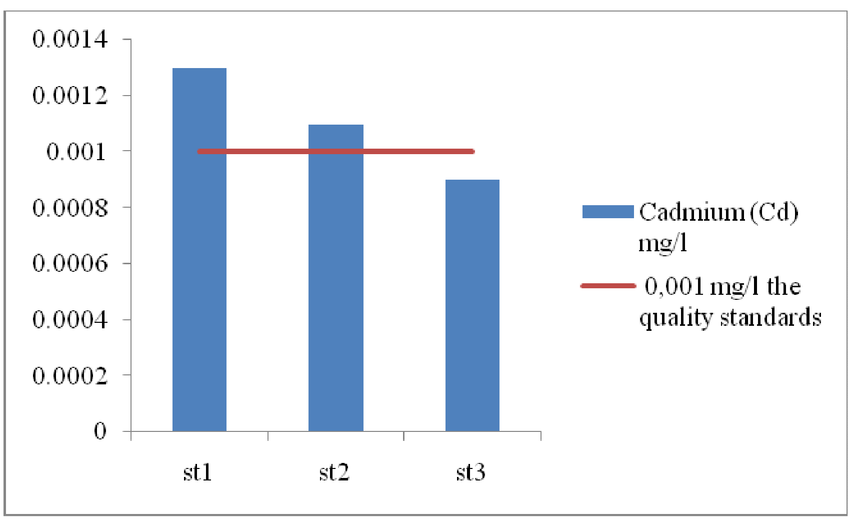

Figure-3
Value Cadmium (Cd) (mg / L) at each location Measurement

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