Water and Soil Analyses of Balongis Fish Cage and Oster (Talaba) Farms in Concepcion River, Kabasalan, Zamboanga Sibugay Province, Philippines

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Abstract- *The decline of the talaba (saccosrea malabonensis) production in Barangay Concepcion, Kabasalan, Zamboanga Sibugay motivated the fisher folks to determine the cause of the phenomenon through the Social Action Ministry (SAM) – Diocese of Ipil, Ipil, Zamboanga Sibugay,Philippines* who arranged for the *conduct of the study. The research was hypothesized to be caused by climate change. Data collection began on January 28 until February 8, 2012 on site. Twelve (12) sampling sites were installed in Concepcion River barangay Balongis, Buayan Zamboanga Sibugay where the barangay's fish cage and oyster (Talaba) farms are Global Positioning System (GPS) gadget was used for the identification/markings of sampling stations (07 ^{0} 46.00 N and 122 ^{0}47.116E to 07 ^{0}45.778 N and 122 ^{0}47.151 E) Water and soil/sediment samples were taken and analyzed once a week for three consecutive weeks – January 28 to February 18, 2012. Physical water parameters were taken in situ (pH, Temperature, salinity and TSS). Water temperature raging 24 ^{0}C-31.5 ^{0}C, water pH 7.0-8.24, water salinity 18 -27.6 ppt. Total Suspended Solids (TSS) ranged 0.104 g/L to 0.672 g/L – classified turbid water for all sampling sites. Sediment analysis: for mercury containment – qualitative analysis is negative, Soil Classification using the Textual triangle – soil classified as Loamy Sand (Sites 7-10) and Sandy Loam for all other sites. Meiofauna component using the Nematoma, turbellaria, Ciliophora, Ostracoda, Gastrotricha, Tardigrada, Sarcomastigaphora, Sincarida, Copepoda and some other unidentified fauna. Sedimentation rate averaged from 1410-6469 g/m^2 per week. The high sediment rate could have caused the decline in oyster production but not by mercury contamination as suspected.*

Keywords – *saccosrea malabonensis, water parameters Water and soil/sediment*

INTRODUCTION

An estuary is a partly closed coastal body of water with one or more rivers or streams flowing into it, and with free connection to the open sea.[1]. Its environment is characterized by a constant mixing of fresh water, saline water, and sediment, which is carried into or from the sea and land.

Hancock and Hunter, explained that the estuarine salinity alone is the most important indicator of mixing, meaning salinity can be used to track water source and mixing frequency. The salinity ranges from full strength seawater to fresh water which can impose challenges to the animals and microbes. Estuarine plants absorb tide and storm surges providing peaceful and stable habitats for the wildlife[2]. The adult oyster or talaba obtains food by straining water through their gills and keeping food particles which later sent toward its mouth. Their food varies according to the locality and the season of the year, such as phytoplankton, diatoms and other water born organisms .

Estuaries usually provide environmental services aside from serving as habitats for wildlife. Since water movement is the dominant controlling factor in estuarine ecosystem, water flowing to the sea or ocean caries sediments, nutrients organic/inorganic and pollutants. Sediments usually are evaluated to establish the status of the estuary as it takes much longer time to change the condition of the sediments while Water quality parameters give a rapid assessment of the conditions [3].

The Balongis aquaculture farm contained fish pens owned by small groups of fisher folks which they differ in species to culture, has no evaluation as to its status. In the Philippines, Bolinao Bay is a well monitored mariculture only when there was fish kill incident in 2011. Water, sediment and biological analyses were conducted .

Based on the results, the most prominent, abundant or "indicator" taxa were further identified to the lowest feasible taxonomic levels and the approximate abundances noted. The resulting data on faunal distribution and abundance and the occurrence of indicator taxa were used to classify the environmental conditions of the sediment according to the Norwegian Standard for environmental monitoring of marine fish farms (NS 9410). The taxonomic groups were: Polychaeta, Gastropoda, Bivalvia, Amphipoda, Natantia, Nemertini, Brachyura, Balanoida, Ostracoda, Porifera, Sipunculida, Ophuroida, Cnidaria and Fish. Out of the 45 grab samples that were analysed, 9 samples had 4 or more taxa , 8 samples had 3 taxa, 18 samples had only 2 taxa, and 10 samples had only one taxon [3].

Historical Background of the Research. The traditional fish-cage-culture fishing system is the main source of livelihood in Barangay Concepcion, Kabasalan, Zamboanga Sibugay, Philippines. In the past, fisher folks enjoyed the vast resources of the river. Variety of marine species and a number of edible shell species, which include the famed oyster, locally known as talaba (*saccosrea malabonensis*), were among the prized produced which provided livelihood to people residing in the area.

The Celebrated event in 2002, during the 2nd Anniversary of Zamboanga Sibugay as a province, highlighted about a kilometer of grilled talaba and is believed to be soon recognized by Guinness World of Records as a legitimate feat. This event somehow put Zamboanga Sibugay as the talaba capital of the Philippines, courtesy of the talaba produced in the brackish waters of Brgy. Concepcion, Kabasalan, Zamboanga Sibugay. The popularity of talaba in the market attracted much attention to fisher folks to produce because of the demand .

However, in 2010, fisher folks observed a lesser quality and production of talaba. Fisher folks believed the changing climate might have contributed much and affected the quality and growth of talaba, alongside with overharvesting. According to the chairman of the Kahugpungan sa Gagmayng Mangingisda sa Concepcion (KGMC,) a local organization whose aims at protecting and conserving the prized marine species in the area, the group is much concern and afraid of the unpredictable and shifting climate conditions. As per community observation, rainy season usually occurs during and in the month of May and ends in October. However, during the rainy season period, they experience drought and hot weather. In the same note, during dry season, community not just experienced drought but heavy rainfall and strong winds as well. They argued that the current weather condition is not the same ten (10) years ago, where they can predict when to rain, when drought strikes and when to farm talaba. These unpredictable weather disturbances had greatly affected their livelihood. Due to this irregular weather occurrences, water temperature changes from time to time. Fisher folks usually feel and experience a sudden drop and rise of weather temperature (a rainy-colder day to hot-dry weather and vice versa). This, in effect, would mean an abrupt change and irregularities in the water temperature. Accordingly, since talaba needs a regular and normal water temperature, the changing water condition in the surroundings had immensely contributed and affected the growth and quality of the said marine species.

Siltation is seen as among the contributory cause to the decline in talaba production. The brackish water of Concepcion is fed by two major rivers (Sininan and Buayan Rivers) and a stream (Simbol River). Constant and heavy rainfall and mining activities in the mountainous and hilly areas within Concepcion and nearby villages causes soil erosions and flooding. The mud and soil sediments because of soil erosions are carried over by the rivers and dump unto the waters of Concepcion. Fisher folk observed a constant decrease in a water level – due to, as theorized, siltation. Considering that fisher folk’s farm cages and talaba farming are located a few meters from shore , constant occurrences of siltation would disturb the normal state of growth and quality of the marine species . Furthermore, the occurrences of irregular and changing climate conditions had as well affected the salinity of the water. Salinity changes primarily because of the amount of fresh water fed by the rivers in Concepcion. The accumulated volume of fresh waters from the previous rainy season had decreased the salinity of the water and people fear that during the next dry period, a sudden increase of salinity due to extreme dry weather or drought may be experience,

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as experienced in the past. The dilemma of the people is on how they are going to predict these weather occurrences and changing climate.

Talaba, as farmers experienced, cannot grow potentially or survive when constantly overridden by mud and changing salinity. However, another shell specie, tagnipis as locals called, was observed to breed and nurture amidst the current conditions compared to talaba. Community interestingly observed that tagpinis has been able to adjust to the condition of the weather, water temperature, siltation and salinity as opposed to talaba,. Accordingly, the factors mentioned as possible causes to the decline of talaba has in no way affected the growth of tagnipis, in fact this shell variety prosper. However, fisher folks cannot identify and determine the direct relationship between the declining talaba and the thriving tagnipis or to whether the prosper of tagnipis is driven by the possibility of the actual climate condition and vice versa.

The decline of the production of talaba possibly be caused by the aforementioned hypothesis and assumptions as observed by the fisher folks is of great concern at the very moment. Fisher folks contend that the changing climate immensely causes the dwindling production of talaba and possibly paved way to the emergence of the thriving tagnipis. However, no evidence or scientific testing/study could justify such claim. Local communities fear that talaba might become extinct. Thereby, measure/s should be done to counter and conserve the prized marine specie before it is gone and next generation will only be able to know the richness and taste of talaba in the tales of the old ones.

The ongoing climate change conditions in the province of Zamboanga Sibugay continue to affect and pose threats to agricultural farmers and fisher folks towards their livelihood. It is evident to the declining yield crops and produce marine products. In a report by NSCB IX, Zamboanga Peninsula's fish catch in Quarter 1 of 2011 is down by as much as 34%, due to weather disturbances that prevailed during the first quarter of this year. The issue on climate change has caused economic and livelihood losses and reduced income to the actual farmers and fisher folks.

Today's aggravated climate condition disturbed the normal farming system and way of living of the affected communities. The need to cope and adapt is a trending alternative to survive. Acknowledging the presence and reality of the climate change condition is not at all fitting; there must be a thorough understanding and study to further investigate the cause of a particular phenomenon and later on provide alternatives and measures.

The case of the decline of Talaba in Barangay Concepcion, Kabasalan, Zamboanga Sibugay believed and observed to be caused by the changing climate posed a threat towards livelihood and pride. People had provided explanations and observation-based accounts to the decline of the beloved marine specie and towards the causes and reasons unto the unexpected prosperity of another local shell variety. However, no formal investigation was undertaken to validate and justify the aforementioned threats and causes. It is with this motive that a research study was conducted : a formal and thorough study and documentation on the actual state of talaba , the condition of the quality of water and soil, and the prosperity of the tagnipis have to be investigated in Brgy. Concepcion.

OBJECTIVES OF THE STUDY

The study aims to determine the profile of the Balongis fish cage and talaba farm in the Conception River. The study specifically aimed to determine the quality through some physic-chemical parameters salinity, pH, temperature, and total suspended solids; and to characterize the Substratum sediments (sedimentations rate, textural, classification of the soil substrates, and Meiofauna components)

MATERIALS AND METHOD

Field works were conducted in Concepcion estuarine , around Balongis fish cage, to get initial profile of the estuarine . Initial survey of the sampling site was done on January 21, 2012 and identified twelve sampling points using the GPS (global positioning system) to determine the latitudinal and longitudinal points.

Data collection began on January 28 – February 8, 2012. Twelve data points taken at each sampling period (Jan 28-Feb 4, Feb 4-Feb 11 and Feb 11-Feb 18), for three weeks were:

Water Quality-In situ data such as **temperature and pH** – were measured using Sartorius pH meter with temperature features, while **Salinity** was measured using Atago refractometer.

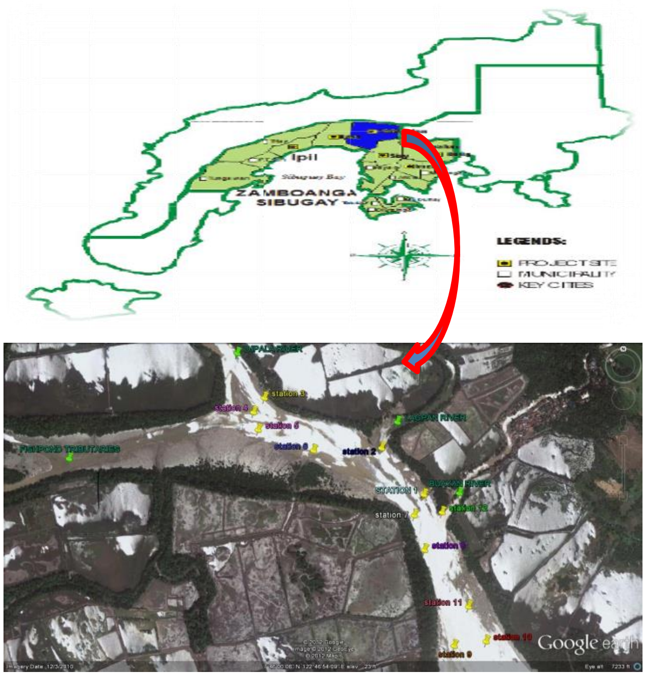

Figure 3. Balongis Fish Cage Farm of Bangangay Concepcion, Kabasalan, Zamboanga Sibugay, Philippines. (Taken from Google Earth)

Total Suspended Solids – volumes of water were collected in one liter plastic containers and filtered through tared 0.45µm membrane Whattman filter paper using a Millipore filtration apparatus. The suspended solids retained on the filter papers were dried in a mechanical oven at 105-110 ^{o}C for two hours, cooled in a desiccator then weighed using an electronic Sartorius top loading balance. Heating, cooling, weighing were repeated until a 0.002 or less from previous reading was obtained. The mass of solids measured was in grams dry weight per liter of water.

Characterization of Sediments-To characterize the surface sediments of the fish cage estuarine, the Talaba culture area , surface sediments were collected using an improvise corer made of plastic capable of extracting sediment samples from depth of 15 cm. The sediments were collected and placed in 2 separated zip-lock plastic bags per station. The sediments in one of the zip-lock plastic bags was preserved by adding 10% formalin in filtered seawater to determine the Meiofauna components and the other were used to classify the sediment.

Presence of Mercury was qualitatively analyzed, done on the surface sediments, following the qualitative analysis of Wismer procedure [4].

Sediment Classification Using Textural Triangle [5]. The sediments were air dried sediments and sieved using 63-500µm mesh to classify sediment particles size. Sediment particles passed through 500 µm and retained in 250µm mesh classified as sand, particles passed through 250µm but retained in 63µm classified as silt while particles passed through 63µm mesh classified as clay. The sediment compositions are represented in terms of percentage (%) of sand , silt and clay. Soil classification is typically made based on the relative proportions of silt, sand and clay. Follow any two component percentages to find the soil type [6].

Meiofauna-The sediment samples in one of the zip-lock plastic bags was fixed by adding 4% formalin in filtered seawater and store in ice chest and brought to the biology lab of ZSCMST to determine the Meiofauna components. In the laboratory, all meiofaunal samples were rinsed with a gentle jet of fresh water over a 0.5mm sieve to exclude macrofauna, decanted over a 38 µm sieve ten times, centrifuged three times with Ludox HS_40 (specific density 1.18), and stained with Rose Bengal. Meiofauna were counted and identified at the major taxon level and documented, using a Photomicrograph.

Sedimentation Rate- An improvised sediment collectors or traps made of 6-7cm inner diameter and about 2 ft. long bamboo, sharpened on one end was planted in each of the 12 – points site of the estuarine, during its lowest tide. After a week and during its lowest tide the sediments were collected, placed in a plastic containers, and stored in a Styrofoam for further analysis. Each sediment collector was returned on its site. The sediment was air dried and weighed using electronic Sartorius top loading balance. The sedimentation rate was determined in grams dried sediments per square meter per week for three weeks.

RESULTS AND DISCUSSION

Water Quality-Field results on water and sediments in the Concepcion estuarine , around Balongis fish cage were obtained from February 4-18, 2012 (See Appendix: Table 1).

For two sampling periods, the observed water salinity ranged 18 - 27.6 ppt , the observed lower salinity were those areas with rivers and fishpond tributaries. The water is considered within the estuarine salinity. On the third sampling period it was observed that the salinity lowered to a range of 4 - 9

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ppt, and this was attributed significantly with freshwater impact from 5 days continuous rain . In small tidally mixed estuaries like this Concepcion, salinity can change from fresh to marine in a tidal cycle usually every 6 hours.

In larger estuaries, salinity gradients affects more gradual. The critical salinity approximately 5-8 ppt. In daily estuaries, where salinity is tidally regulated, benthic organisms faced a great physiological stress because they experienced both fresh and saltwater in a single tidal cycle [7]. Talaba is one of the benthic organisms could face and felt physiological stress since the Concepcion estuarine depth has dramatically lowered compared to few decades.

The observed pH of the estuary water has a range of 7.0– 8.24 . Estuary pH levels generally average from 7.0 to 7.5 in fresher sections, to between 8.0 to 8.6 in the more saline areas. Many species have trouble surviving if pH levels drop under 5.0 or rise above 9.0. Shifts in water pH also affects water's chemistry – if the pH levels are lowered solubility of some toxic metals iron, copper, mercury , in the estuary's sediment can be resuspended in the water column. Most estuarine organisms prefer conditions with pH values ranged 6.5-8.5.[8] The pH of the Concepcion estuary water indicates that It still has a good natural buffering effect .

The observed temperature in the Concepcion estuary ranged from 24-31.5^{o}C , the sampling duration averaging three to four hours usually eleven (11) o'clock in the morning up to three (3) o'clock in the afternoon which explains the observed increase in temperature.

In estuaries, tidal mixing generally prevent warm, intermediate and cold layer temperatures [7], but due to the decrease in depth and size of Conception estuary temperature difference decreases from surface to bottom .

Results show differences in temperature, pH and salinity depending on the location – low salinity value at stations near to freshwater sources and higher salinity value at location near to marine water . These values represent only a momentary spot on the situation while sample-taking and are likely to be different depending on daytime and season. The data conform our expectations of an highly influenced and changing ecosystem at the tide area.

The total suspended solids refer to any matter suspended only a minute fraction of the water and which retained by a filter. These suspended solids can come from silt, decaying plant and animals, industrial wastes and sewage. Total suspended solids within the study area ranged from 0.104 g/L to 0.672 g/L this values classified as turbid were TSS $\leq$ 1mg/L classify as clean water while greater than 100mg/L classify as turbid water [9]. The Philippines and ASEAN does not have a specific standard for TSS, DAO 34, 1990 – the acceptable TSS value is based on the previous sampling that it should not increase by more than 10%. Suspended solids have particular relevance for organisms that are dependent on solar radiation and those whose life forms are sensitive to deposition. High concentrations have several negative effects, such as decreasing the amount of light that can penetrate the water slowing photosynthesis in the process which in turn can lower the production of dissolved oxygen; increase absorption of heat from sunlight: low visibility which will affect the fish' ability to hunt for food; clog fish's gills; prevent development of eggs and larva. Some factors that affect concentration of suspended solids are high water flow rate, soil erosions, urban run-off, septic and wastewater effluents, decaying plants and animals and bottom feeding fish/organisms. The low clarity of the water also explains the absence of grasses at the bottom.

Characterization of Sediment -Some natural controls on the sedimentation rates experienced by coastal waterways include climate (rainfall, seasonality), geology, slope (or topography), vegetation and the size of the catchment. The estuary in Concepcion Kabasalan contains the Balongis Fish Cages and "Talaba farm".

Based on **Mercury qualitative analysis**, the sediment are not contaminated with Mercury as what was suspected.

Soil/sediment textural classification-Laboratory data for Sediment composition in percentage sand, silt and clay are shown in Table 2. The sand grain size predominant throughout the study area of the Concepcion estuary are within the 250-125 µm . Using the Soil Textural Triangle [5], sediment classification is sandy loam for stations 1-6 and 11-12, described as sandy feel and adheres to at least one finger [10]. Stations 7-10 classified as Loamy sand and described as very sandy feel and has little adhesion to at least one finger, for which these stations located seaward.

Table 2. Sediment particle size composition

Station No.	% Sand (500-125μm)	%Silt <125 – 65μm	%Clay <63 μm	Sediment texture
1	56.26	27.39	15.93	Sandy loam
2	57.79	26.94	15.27	Sandy loam
3	63.77	28.31	7.92	Sandy loam
4	61.39	28.11	10.50	Sandy loam
5	58.29	26.94	14.94	Sandy loam
6	70.45	19.27	10.28	Sandy loam
7	72.09	17.83	10.08	Loamy Sand
8	72.47	17.75	9.80	Loamy Sand
9	73.53	15.81	10.66	Loamy Sand
10	76.43	14.73	8.84	Loamy Sand
11	60.89	27.14	11.97	Sandy loam
12	59.53	26.08	14.39	Sandy loam

Sandy loams consist of soil materials containing somewhat less sand, and more silt plus clay, than loamy sands. As such, they possess characteristics which fall between the finer-textured sandy clay loam and the coarser-textured loamy sands. Many of the individual sand grains can still be seen and felt, but there is sufficient silt and/or clay to give coherence to the soil so that casts can be formed that will bear careful handling without breaking [10].

Loamy sands consist of soil materials containing 70-90% sand, 0-30% silt, and 0-15% clay. As such, they resemble sands in that they are loose and single-grained, and most individual grains can be seen and felt. Because they do contain slightly higher percentages of silt and clay than do the sands, however, the loamy sands are slightly cohesive when moist, and fragile casts can more readily be formed with them than with sands [10].

In the Biology Laboratory, the preserved fauna extracted and sorted into major taxonomic groups. The taxonomic groups were: Nematoda, Turbellaria, Cilliophora, Ostracoda, Gastrotricha, Tardigrada, Sarcomastigaphora, Sincarida, Copepoda. There are fauna which could not completely identified due to improper documentation and they were coded as Sp1, Sp2, Sp3, Sp4, Sp5, Sp6 and Sp7 (See Appendix: Table 3)

The presence and proximate abundance of fauna were used to classify the environmental condition of the sediment according to the Norwegian Standards for environmental monitoring of marine fish farms (NS 9410). Classification criteria are summarized in Table 4.

Table 4. Classification of environmental status based on a semi-quantitative fauna analyses (NS 9410)

1 - (Very Good)	At least 20 taxa. None of the taxa comprising over 65% of the sample
2 - (Good)	5-19 taxa. More than 20 individuals except Nematoda. None of the taxa comprising 90% of the sample
3 - (Acceptable)	1-4 taxa. (except Nematoda)
4 - (Unacceptable	No animals

Using the Norwegian Classification to categorize the sediments of Concepcion estuary, no sampling station had shown *Very Good* nor *Unacceptable* out of the 12 sampling stations. Eight sampling stations are classified as *Good* while 4 classified as *Acceptable* based on the number of taxa. But if follow the other criterion that there should be more than 20 individuals per taxa, the overall classification of the sediment is *Good*.

Sedimentation rate (see Appendix: Table 1) in the study area has a range of 1410-6469 g/m^2-wk. The high suspended solids explained that the high sediment loads delivered to estuaries in response to waterborne erosion, and these could be attributed to the soil erosions from the fishponds that surround the estuary.

One observation noted is that the down flow of the water with all particulate matters that has been carried up did not flow down as it should be because there are hindrances to the flow of water which are the planted FISH CAGES.

High sedimentation rates can bring about rapid changes in the form and function of coastal waterways. For example, in wave-dominated estuaries the configuration of habitats alters:

> *fine sediment derived from the catchment and also produced within the estuary flocculates and settles in the margins of the estuary, forming mud flats where there may have formerly been relatively clean sand*

Habitats may be smothered where sediment is deposited more rapidly tolerated by benthic communities. For example, loss of seagrass areas and macroalgae can destabilise bottom sediments formerly protected from wind and tidal erosion by the sheltering and binding abilities of macrophyte colonies. Such changes also constitute pressures on fish assemblages and benthic invertebrate numbers such as Talaba.

Several studies have shown that sediment loads delivered to estuaries have dramatically increased in response to waterborne erosion (gully, stream bank/streambed and sheet wash erosion) in catchments in which large tracts of native vegetation have been cleared and replaced with intensive agriculture and urban areas. Siltation may be particularly catastrophic following intense rainfall events . It has also been found that in some estuaries the rate of infilling may have further accelerated during the last few decades compared to earlier in the last century, highlighting the fact that enhanced sedimentation is an ongoing management issue.

The net result is high sedimentation rates is an increase in the maturity of coastal waterways, and a decrease in their overall lifespans. Reductions in the biodiversity, health and integrity of coastal ecosystems may also occur. In order to make better-informed management decisions there is clearly a need to accurately assess the rate and nature of sedimentation within coastal waterways and any changes in other sedimentological parameters over time [11].

Sedimentological data are especially important where conservation or restoration actions are being planned and there is a lack of historical information to indicate how the estuarine environment has changed over the past two centuries or past few decades. Likewise, these data can aid in the development of models of sediment transportation. The information gained from the analysis of sediment cores, therefore, needs to be viewed as basic environmental data needed for the effective management of estuarine systems.

RECOMMENDATION

There is a need for dredging of the mud to give space for water ways to flow. Continue planting of mangroves to the buffer zone of the fishpond. Buffer Zone should be 10 meters following the RA 8550 (Fisheries Laws).

1. Create a nursery/sanctuary for talaba broodstock for spawning.
2. Remove/harvest bivalve that could compete their production.
3. Compute the carrying capacity of the Balongis Fish farm and regulate aquaculture activities, e.g. setting maximum allowable number of cages, stocking density, ideal sites, etc.
4. Monitor the compliance and physical monitoring on all point sources of effluent based on standard criteria for the aquaculture industry.

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Appendix

Table 1. Range of water salinity, pH, temperature and total suspended solids (TSS) and sedimentation rate (SR) in Concepcion River for three weeks

Station No.	Location N	Location E	Salinity $^{0}/_{00}$	pH	Temp ^{o}C	TSS g/L	SR g/m^2-wk
1	07°46.000'	122°47.116'	9.0-24.5	7.00-7.78	27.5-29.0	0.336-0.428	6469.10
2	07°46.197'	122°47.030'	7.0-24.5	7.00-7.84	24.5-29.5	0.296-0.354	6453.94
3	07°46.187'	122°46.783'	4.0-24.5	7.00-7.69	24.5-29.0	0.104-0.290	-
4	07°46.173'	122°46.768'	5.5-24.5	7.10-7.61	24.5-28.0	0.252-0.324	5710.54
5	07°46.115'	122°46.869'	4.0-24.5	7.10-7.64	24.5-29.0	0.105-0.446	1410.80
6	07°46.109'	122°47.886'	5.0-24.0	7.20-7.79	24.0-29.0	0.109-0.196	2021.44
7	07°45.921'	122°47.104'	8.0-24.0	7.33-7.94	24.0-30.0	0.215-0.446	3457.91
8	07°45.775'	122°47.156'	8.5-25.0	7.40-8.18	25.0-30.1	0.117-0.705	2985.89
9	07°45.681'	122°47.175'	9.0-27.0	7.46-8.24	27.0-31.5	0.278-0.672	-
10	07°45.766'	122°47.163'	9.0-27.6	7.46-8.24	27.0-29.0	0.233-0.584	-
11	07°45.971'	122°47.147'	9.0-27.0	7.46-8.24	27.0-29.0	0.229-0.542	-
12	07°45.778'	122°47.151'	7.0-23.0	7.36-7.66	27.0-29.0	0.138-0.274	3575.89
Range for all stations			**4.0-27.6**	**7.00-8.24**	**24.0-31.5**	**0.104-0.672**	**1410.80-6469.10**

Table 3. Meiofauna Composition in the Sediments of Balongis Fish Cage Farm of Bangangay Concepcion, Kabasalan, Zamboanga Sibugay species

tax. Group	**Abundance (# of individuals)** Station **Abundance (# of individuals)**											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Nematoda	450	370	230	420	340	110	120	20	346	90	160	190
Turbellana	160	310	320	310	240	120	160	250	150	100	210	50
Cilliophora	20		30	80	60	20	20	20	10	10	50	
Ostracoda	20	60	90	10	50	70	60	40	80	20	30	10
Gastrotrida	10	20	20		10		20	10	20		20	
Tardigrada				20	30						10	
Sarcomastigaphora	20	80	10		20	10					10	30
Sincarida	10		10			30						
copepoda	10					30	10	10		30		
Sp1		20	10			10						
sp 2					10							
Sp3												
Sp4									10		10	
Sp5												10
sp 6						10						
sp 7												
total	**700**	**880**	**670**	**840**	**760**	**380**	**390**	**350**	**610**	**260**	**500**	**290**