

EFFECTS OF OYSTER BIODEPOSITS RESUSPENSION ON ECOSYSTEM PROCESSES WITH A FOCUS ON ZOOPLANKTON ABUNDANCE AND COMPOSITION.

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PHOTOGRAPHY



New Words

Mesocosm – an outdoor experimental system that mimics the natural environment.

Zooplankton – small weakly swimming or drifting animals that make up the food supply in aquatic environments.

Copepods – a group of small crustaceans such as Acartia, Copepod nauplii, Harpacticoid, Cyclopoid copepods, etc. that providing food for many species of fish.

Resuspension – mixing.

Bio deposits – poo.

INTRODUCTION

➤ **IN THE 2017 EXPERIMENT:**

- **- 6 SHEAR-TURBULENCE-RESUSPENSION-MESOCOSMS (STURM) TANKS:**
- ALL TANKS HAD BOTTOM SEDIMENT**
- ALL TANKS HAD RESUSPENSION.**
- 3 TANKS HAD OYSTER BIODEPOSITS**
- 3 HAD NONE.**

MY INTERNSHIP WAS FOCUSED ON THE RESPONSE OF ZOOPLANKTON FROM THE 2017 EXPERIMENT.



HYPOTHESIS



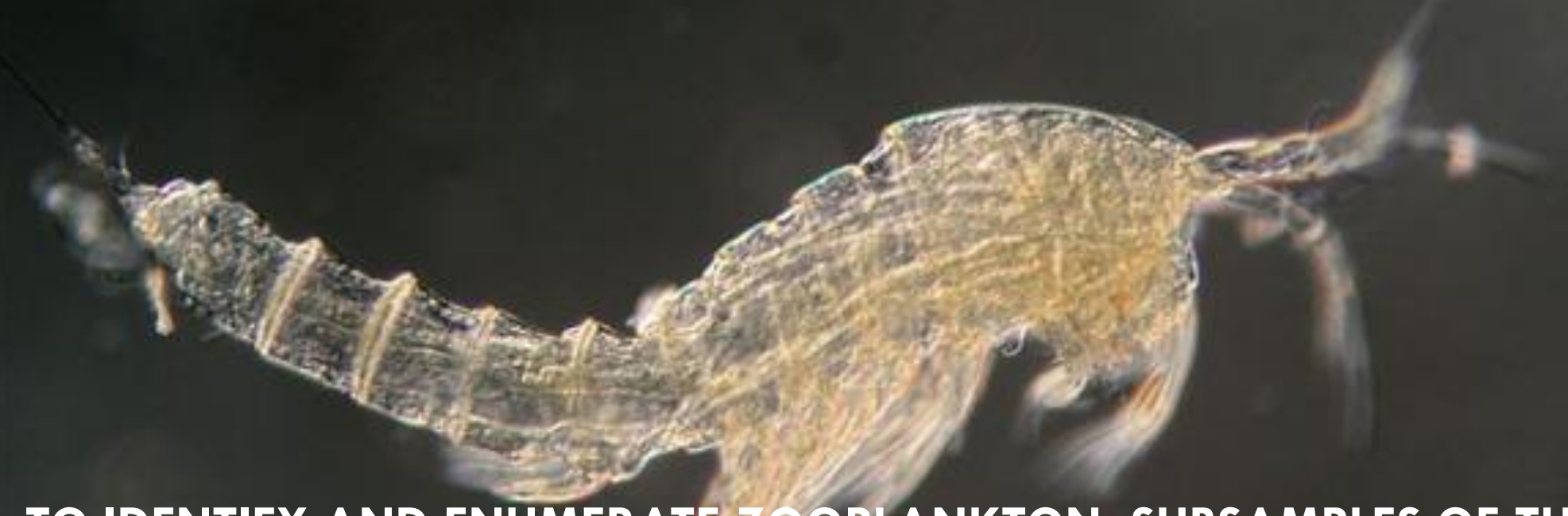
- TRANSFER OF BIODEPOSITS AS NUTRIENTS BY RESUSPENSION WE WILL SEE AN INCREASE IN THE ABUNDANCE AND CONCENTRATION OF PHYTOPLANKTON.
- PHYTOPLANKTON IS A FOOD SOURCE FOR ZOOPLANKTON THEREFORE WE WILL SEE AN INCREASE IN ZOOPLANKTON FROM THE TANKS THAT CONTAINED BIODEPOSITS.

FIELD METHODS



- ZOOPLANKTON SAMPLES WERE COLLECTED FROM EACH TANK ON 8 DATES BETWEEN 6/29/17 – 7/24/17.
- FOR ZOOPLANKTON, SAMPLES WERE COLLECTED FROM EACH TANK BY PUMPING 40 L OF WATER THRU 63 MICROMESH NETTING USING A DIAPHRAGM PUMP; CONCENTRATE WAS Poured INTO GLASS JARS AND PRESERVED WITH BUFFERED FORMALDEHYDE.

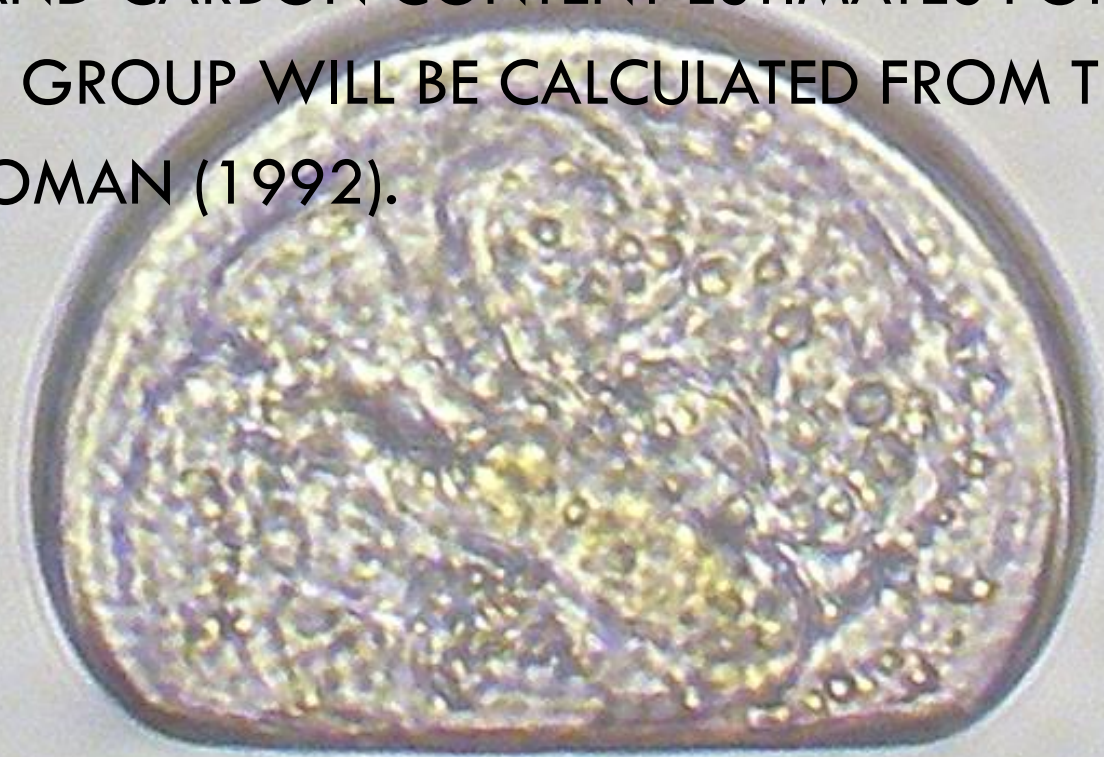
LAB METHODS FOR SAMPLE ANALYSIS



TO IDENTIFY AND ENUMERATE ZOOPLANKTON, SUBSAMPLES OF THE JAR CONTENTS WERE OBTAINED USING A HENSEN-STEMPLE PIPETTE AND PLACED ON A COUNTING WHEEL. ORGANISMS WILL BE IDENTIFIED AND COUNTED TO LOWEST PRACTICAL SPECIES AND LIFE-STAGE USING A DISSECTING SCOPE.

DATA ANALYSIS

- COUNTS WERE CONVERTED TO NUMBERS PER LITER.
- BIOMASS AND CARBON CONTENT ESTIMATES FOR EACH SPECIES OR GROUP WILL BE CALCULATED FROM THE LITERATURE WHITE & ROMAN (1992).



- T-TEST WAS USED TO DETERMINE IF DIFFERENCES BETWEEN TREATMENTS IN ABUNDANCE AND SPECIES COMPOSITION ARE SIGNIFICANT ($P = <0.05$).



➤ ZOOPLANKTON DATA WERE EXAMINE TO CHARACTERIZE RESPONSE TO DIFFERENCES IN THE RESUSPENSION (R) TANKS, AND THE RESUSPENSION WITH BIODEPOSITS (R_BD) TANKS.

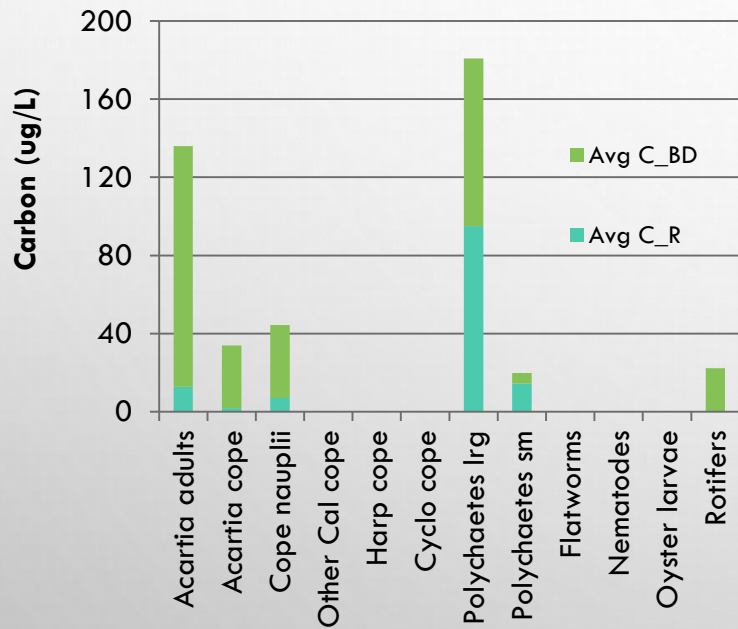
➤ PHYTOPLANKTON DATA WERE EXAMINED TO SEE IF THERE WERE OBSERVABLE LINKAGES BETWEEN PHYTO-AND ZOOPLANKTON ABUNDANCE (NUMBER PER LITER AND MICROGRAMS CARBON PER LITER).

Graphs and Charts to Follow

- ❖ **Dissolved Oxygen - important for respiration. A caution point would be 2mg/L.**
- ❖ **Temperature - important for consistency.**
- ❖ **TSS - important to not to be too dense.**
- ❖ **Chlorophyll a - important as surrogate measure of phytoplankton.**
- ❖ **Acartia Carbon Comparison.**
- ❖ **Comparison of species carbon between R and R-BD**

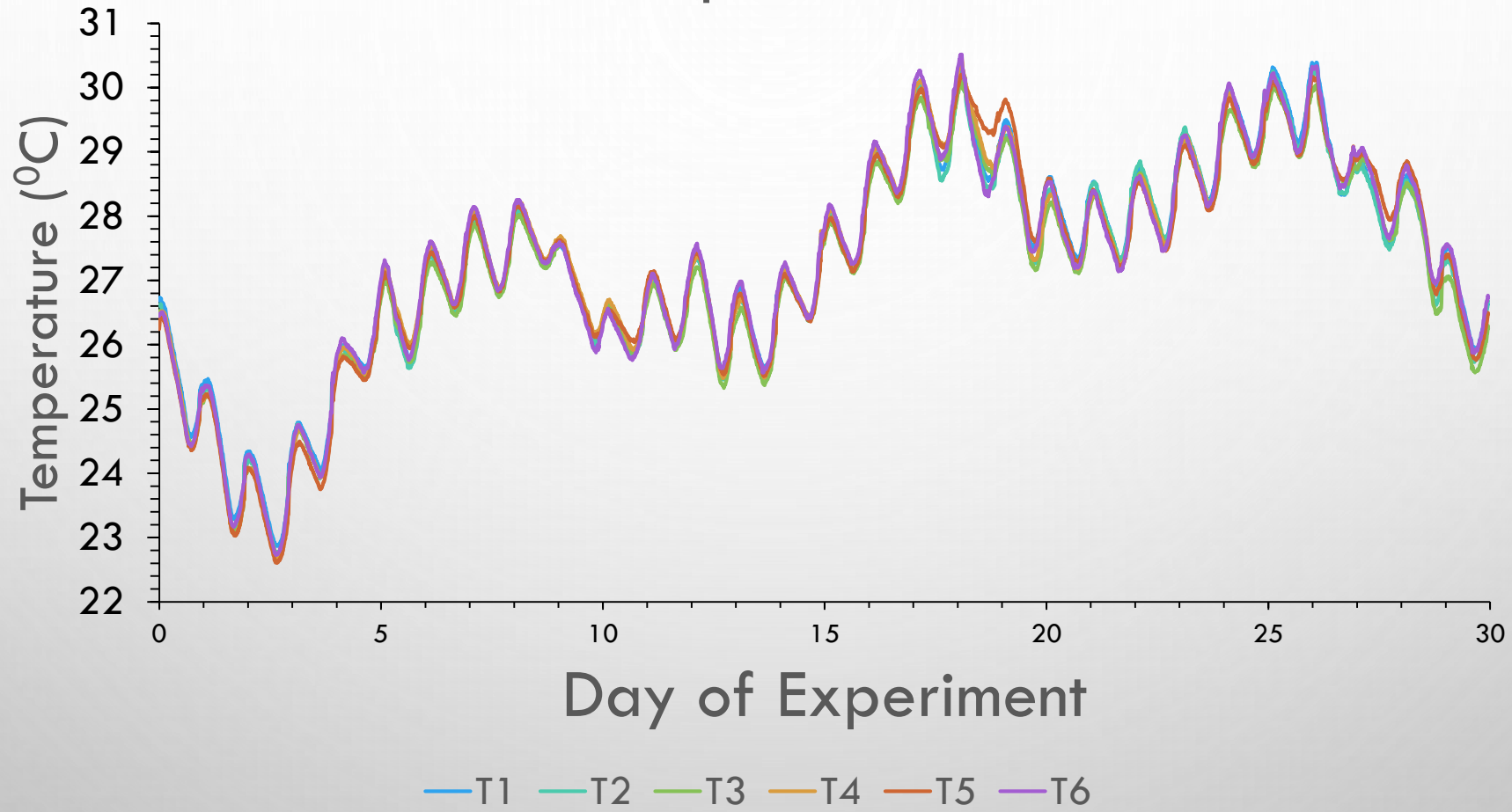


Zooplankton Groups, measured as Carbon, in R_Tanks vs R_BD Tanks

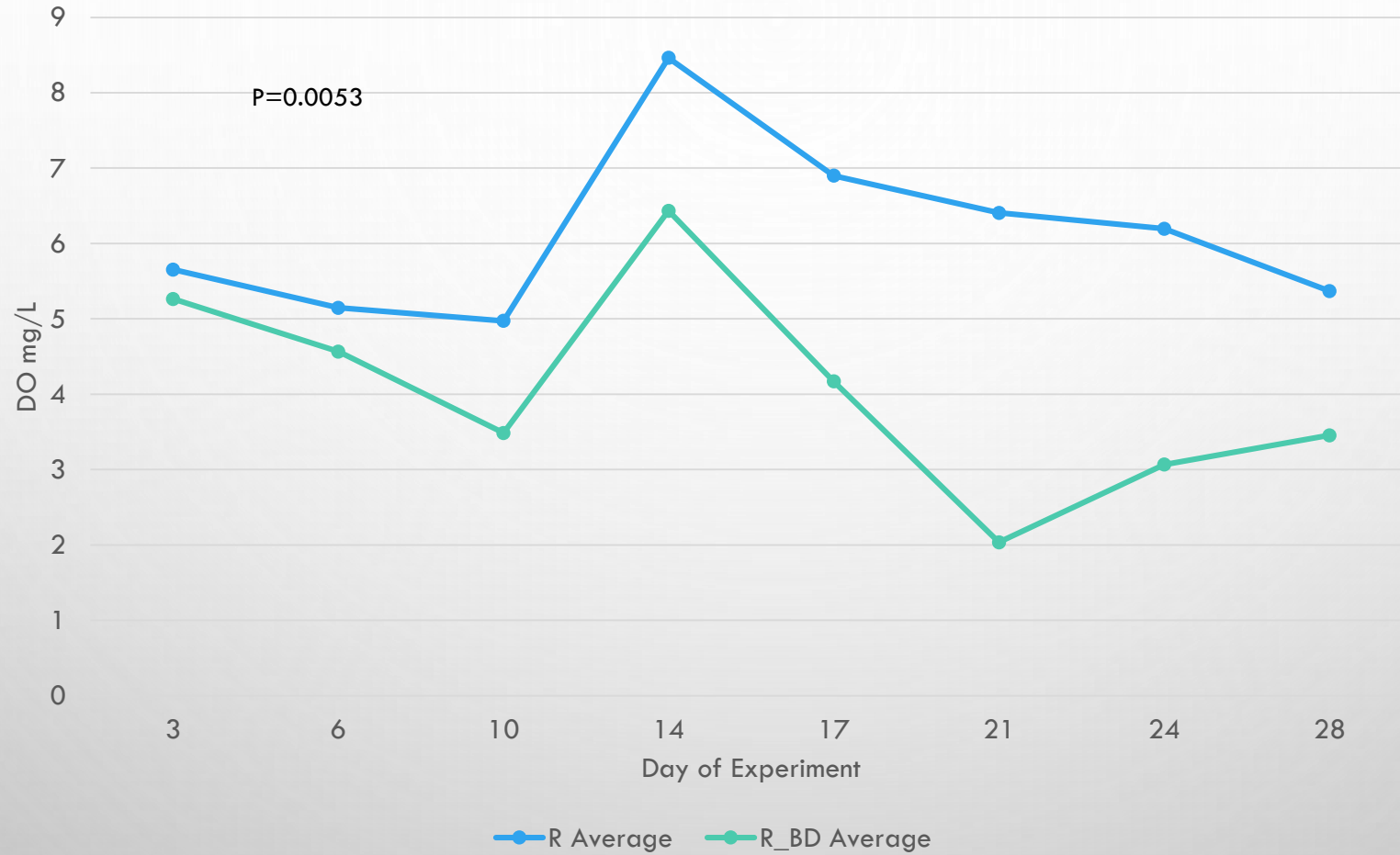


Organism	R_BD		t-test
	R tanks	tanks	
Num/Liter	Mean	Mean	
	N/L	N/L	p_Value
Acartia Adults	4.99	52.32	0.002
Acartia cope	2.11	37.16	0.142
Copepod nauplii	70.67	382.16	0.059
Polychaete larvae (large)	14.38	15.43	0.895
Polychaete larvae (small)	21.43	10.59	0.400
Veliger larva (Oyster)	0.22	0.33	0.405
Rotifers	0.48	57.94	0.166
Harpacticoid copepods	0.05	0.60	0.151
Cyclopoid copepods	0.04	0.08	0.378
Other Calanoid copepods	0.05	0.03	0.561
Flatworms	0.09	0.37	0.102
Nematodes	0.09	0.08	0.895

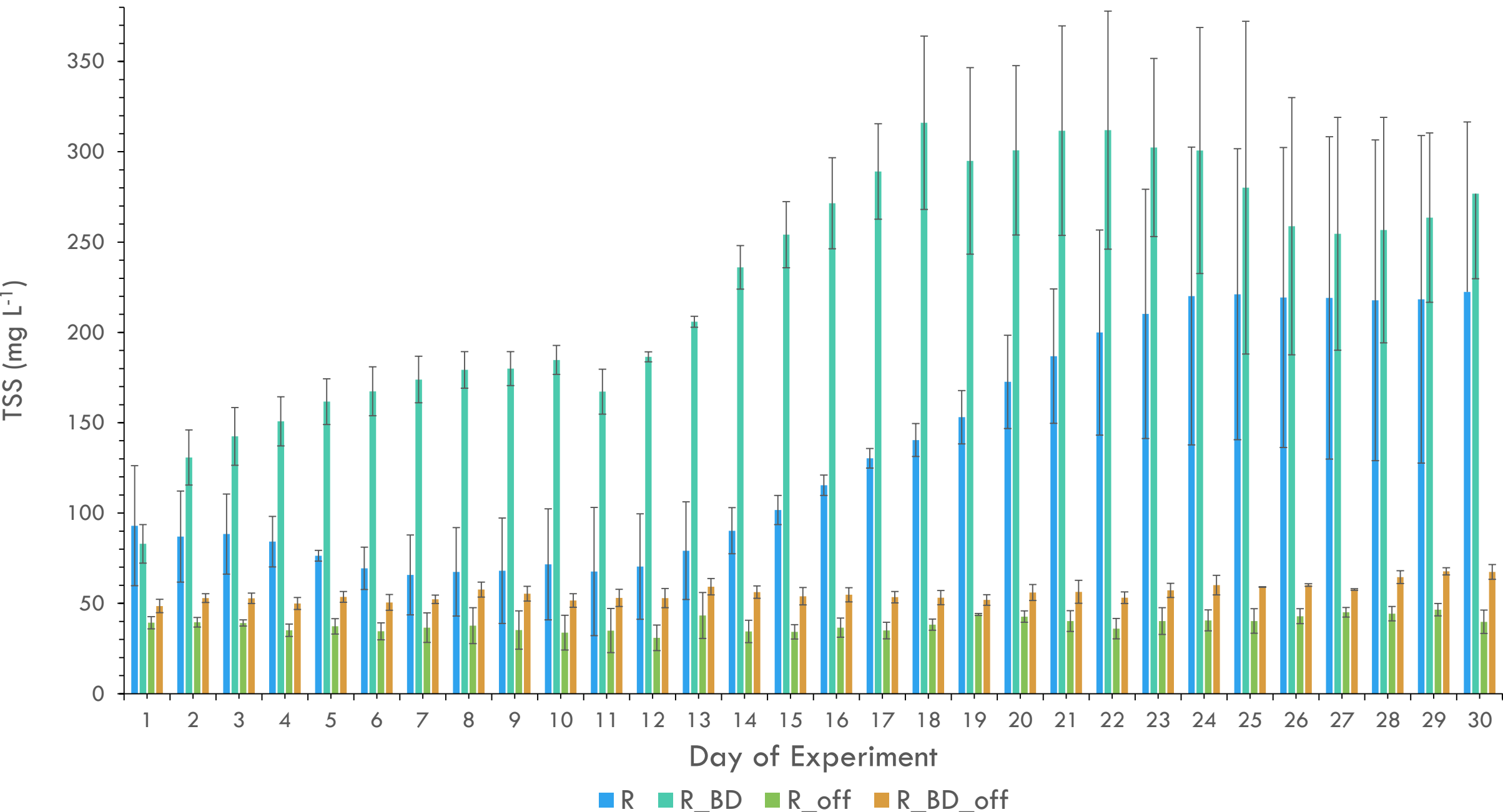
Temperature



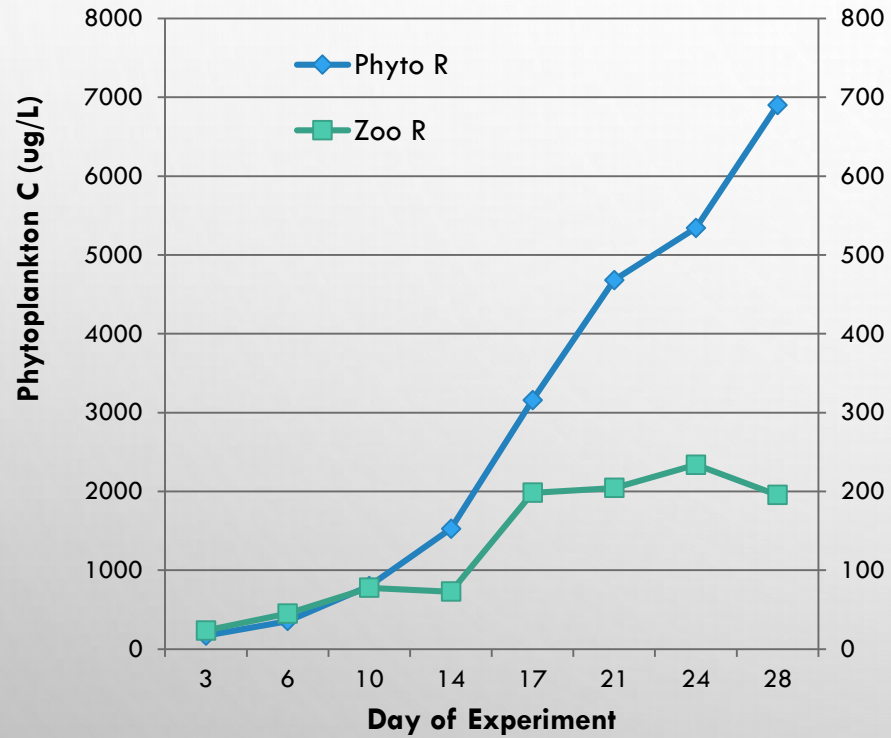
Dissolved Oxygen



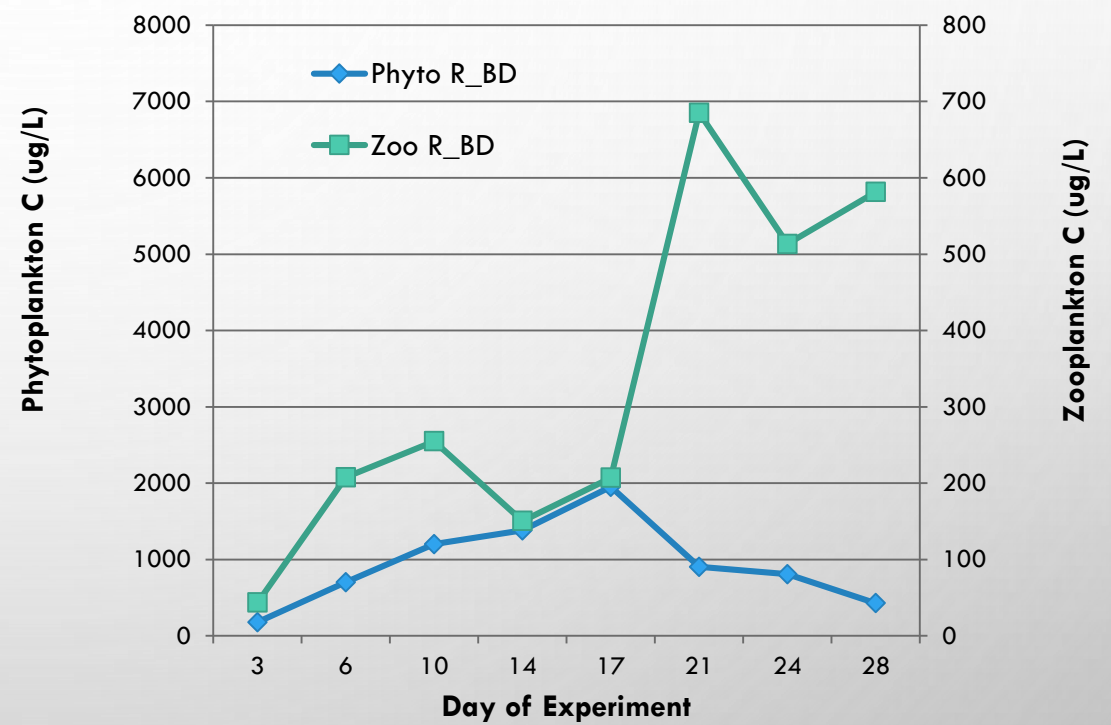
Total Suspended Solids (TSS)



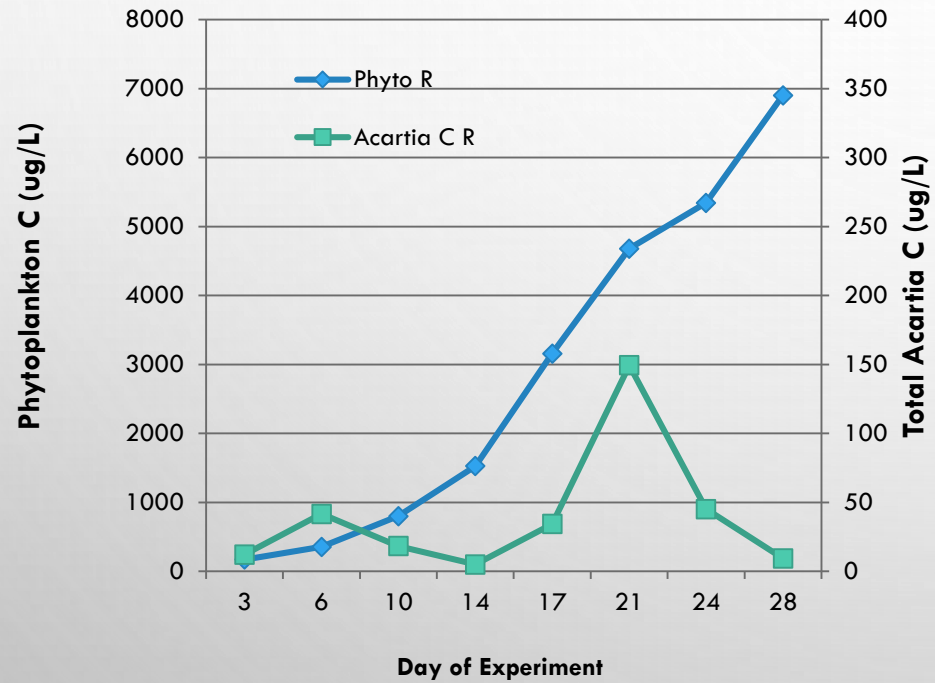
**Total Zooplankton C vs Total Phytoplankton
in R Tanks**



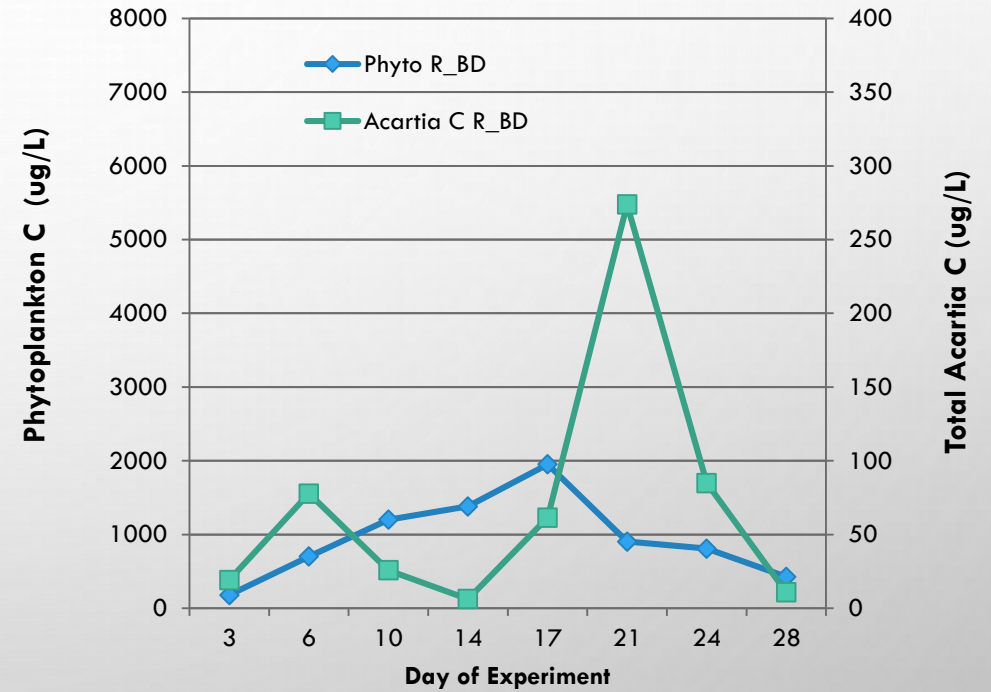
**Total Zooplankton C vs Total Phytoplankton C
in R_BD Tanks**



Acartia C vs Phytoplankton C R



Acartia C vs Phytoplankton C R_BD



Summary

The tanks that had resuspension with bio-deposits showed a significantly higher abundance of *Acartia* adult population and phytoplankton. Therefore both hypotheses are supported.

Discussion points:

The difference in the zooplankton growth and growth of phytoplankton can not be explained by differences in temperature.

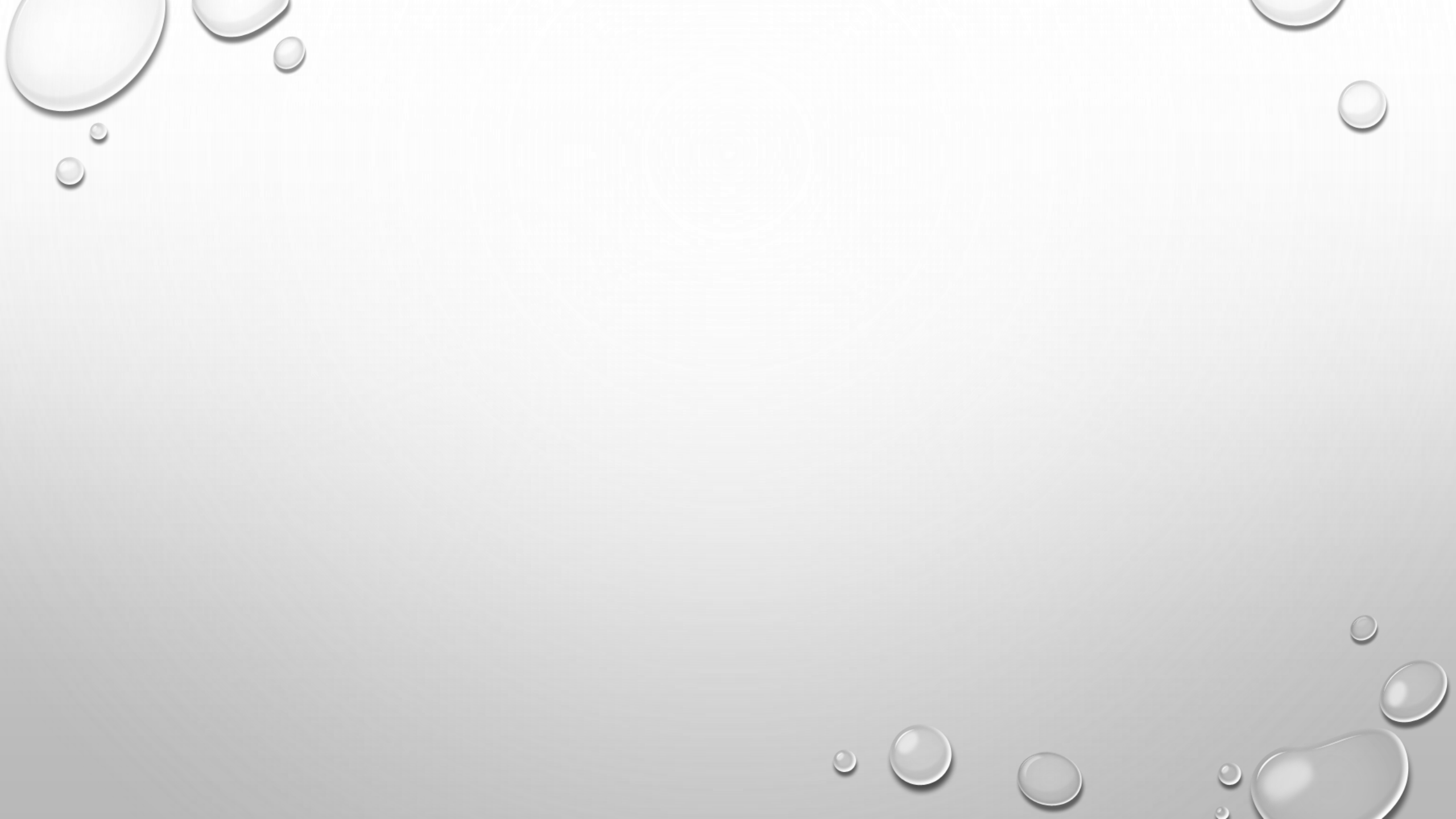
The differences in dissolved oxygen does not offer an explanation for the increase in the second have of the experiment for zooplankton and phytoplankton.

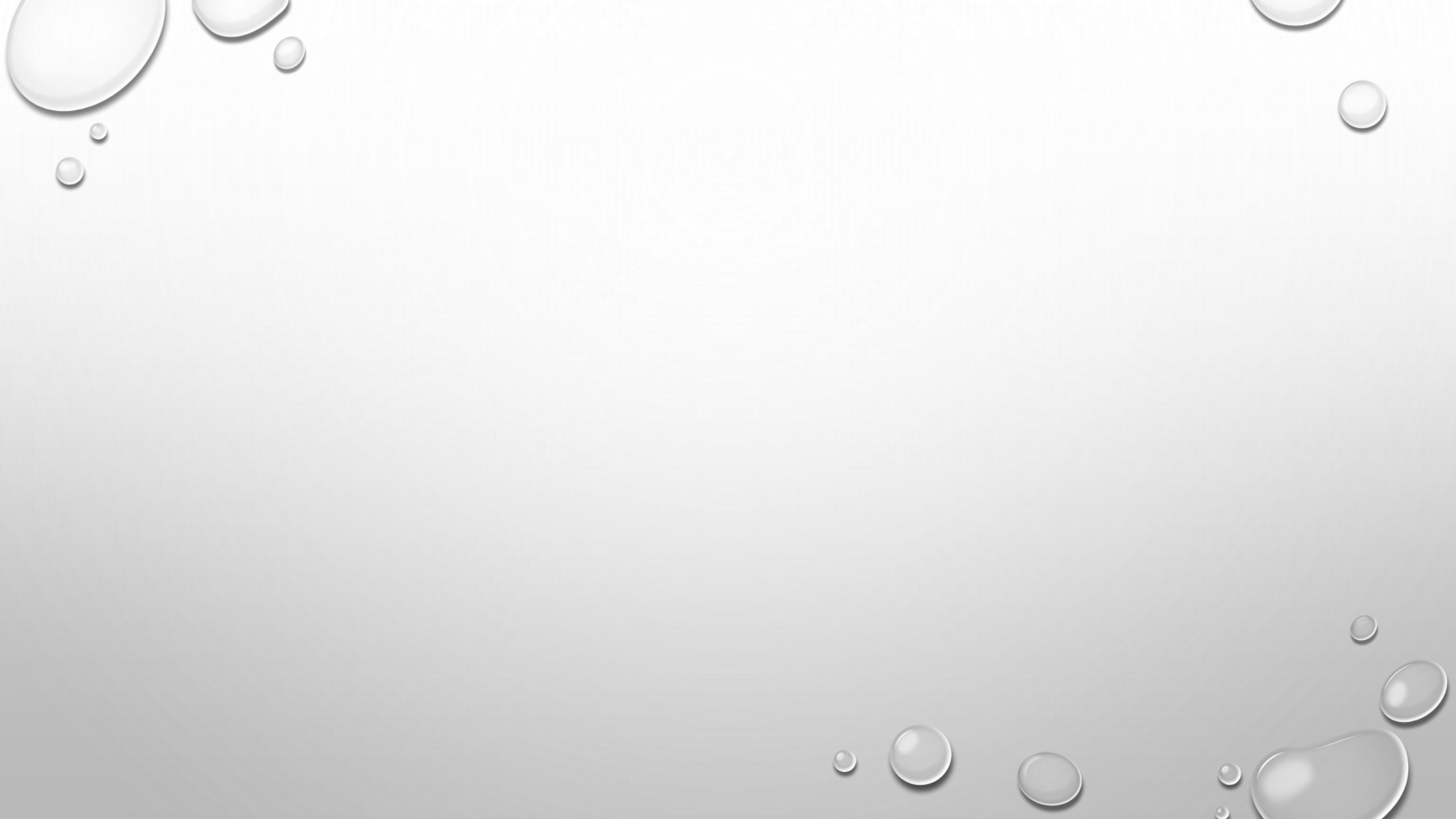
The zooplankton population was dominated by the copepod species and different life stages.

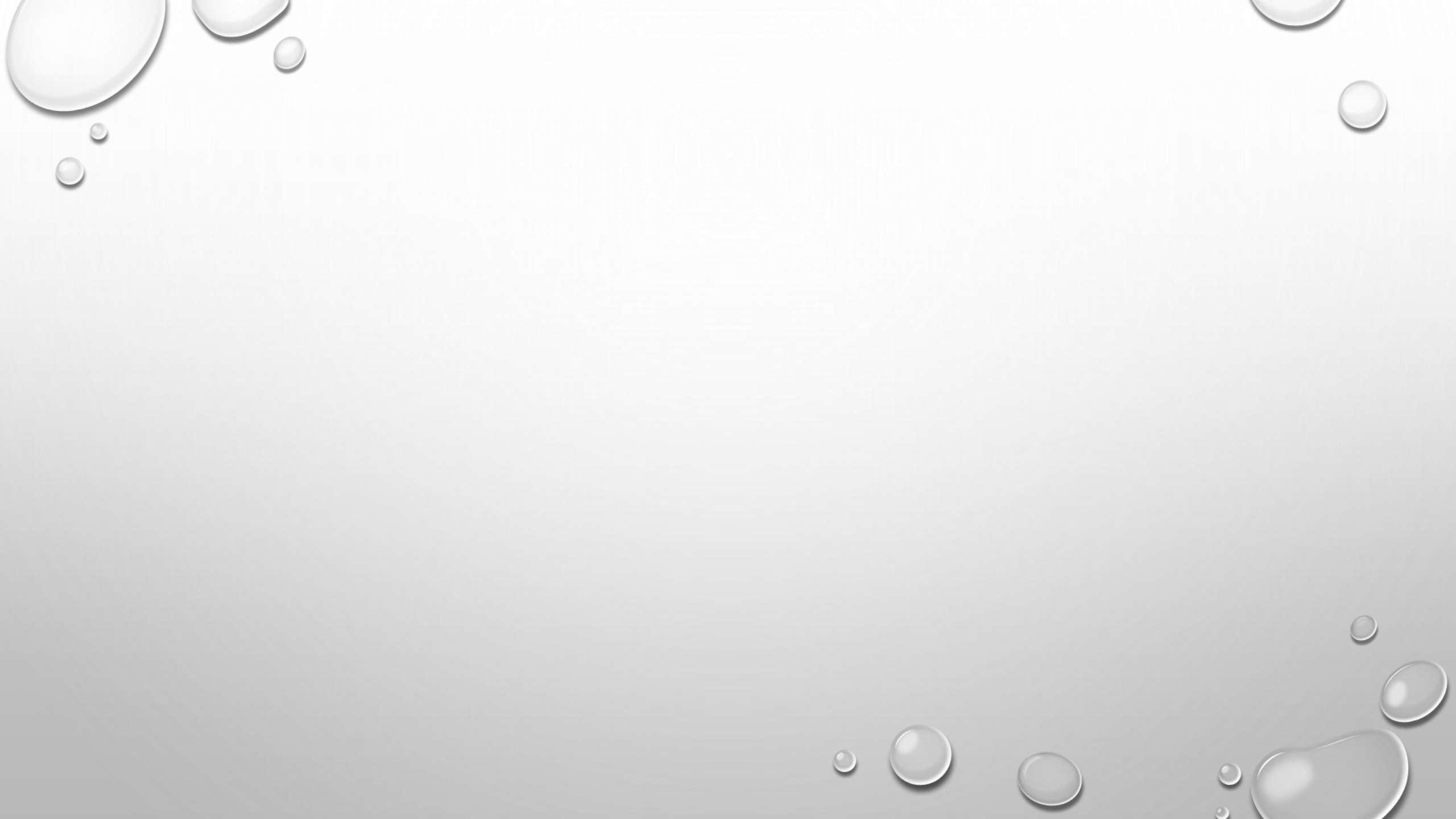




Questions ?



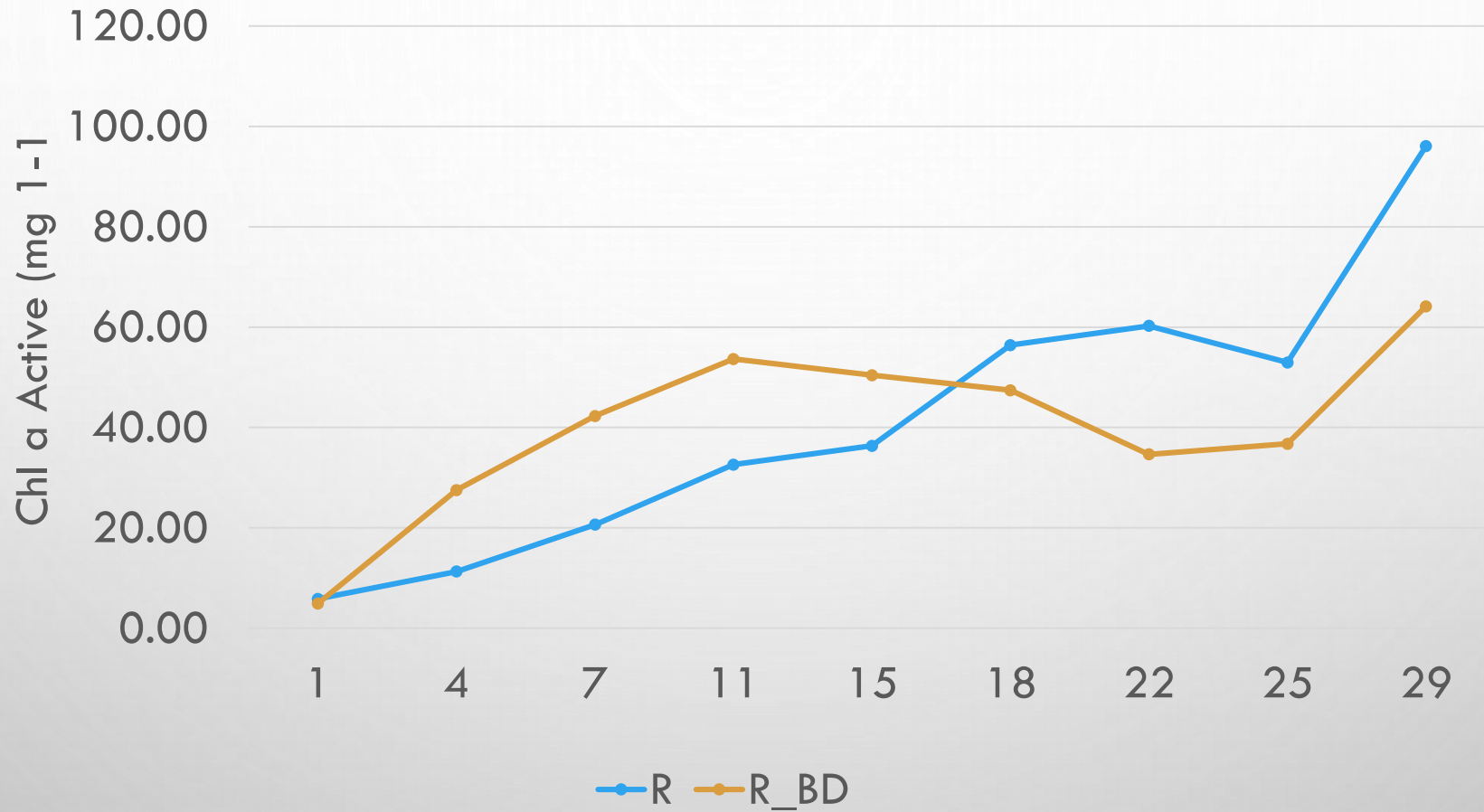




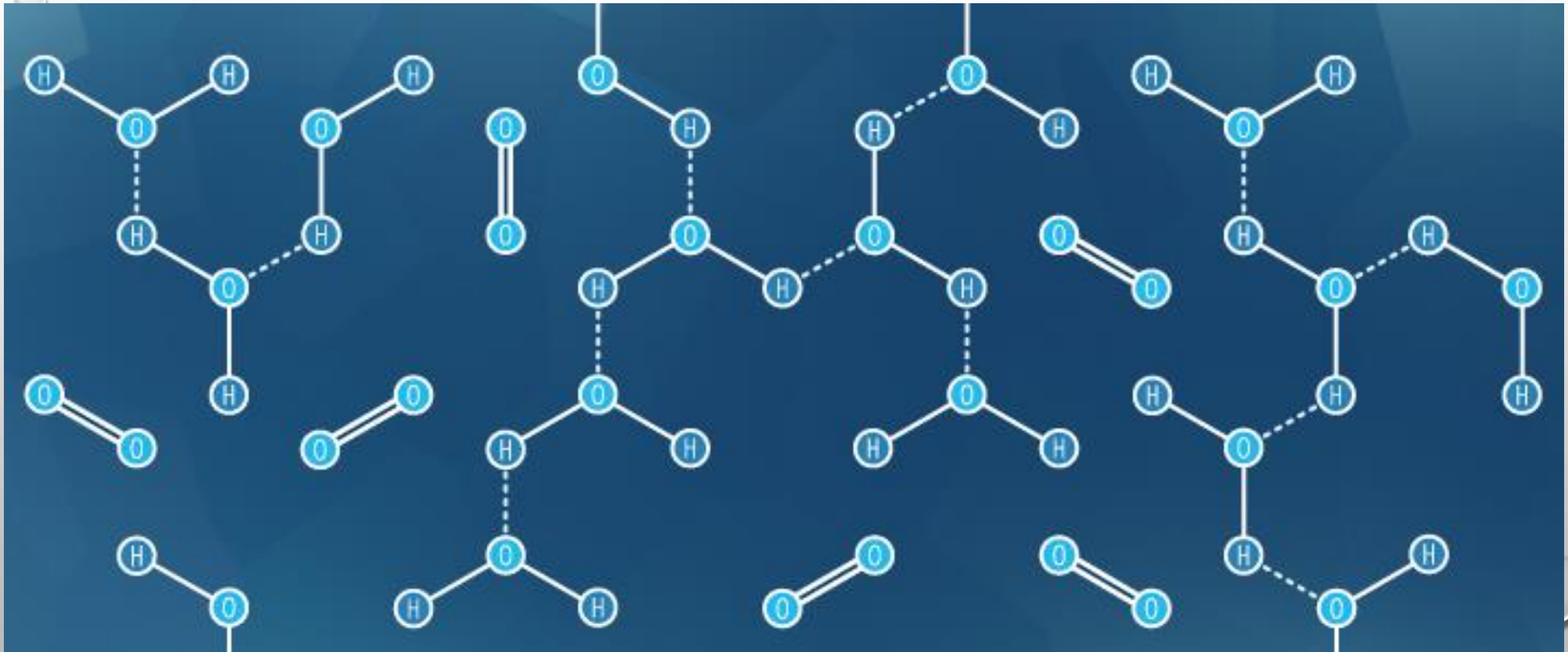
DISSOLVED OXYGEN (DO)

- EVERYTHING IS CONNECTED.
- WATER IS A COMPOUND MOLECULE MADE UP OF 2 ATOMS OF HYDROGEN AND 1 ATOM OF OXYGEN (H₂O). DISSOLVED OXYGEN IS A FREE NON COMPOUND OXYGEN THAT IS PRESENT IN WATER. (GRAPHIC)
- LIVING AQUATIC SPECIES REQUIRE IT FOR RESPIRATION THROUGH THEIR GILLS. PLANTS REQUIRE IT WHEN THERE IS NO LIGHT.
- AS DISSOLVED OXYGEN INCREASES SO DOES WATER QUALITY, ALTHOUGH THERE IS A SATURATION POINT OF 100%. THIS HAPPENS WHEN WATER IS HOLDING AS MUCH AS IT CAN IN EQUILIBRIUM TO THE ATMOSPHERE.
- IN SYNC WITH OTHER FEEDBACK SYSTEMS AN INCREASE OF DISSOLVED OXYGEN CAN BE BENEFICIAL.

Chl a



DISSOLVED OXYGEN



CHLOROPHYLL A

- EVERYTHING IS CONNECTED.
- CHLOROPHYLL A IS THE GREEN PIGMENT IN ALL PLANTS FOR THE PROCESS OF PHOTOSYNTHESIS.
- LIGHT ENERGY (SOLAR) IS CONVERTED TO CHEMICAL ENERGY TO CONVERT CARBON DIOXIDE TO CARBOHYDRATES IN THE FORM OF GLUCOSE WHICH IS THE MAIN ENERGY SOURCE FOR PLANTS
- TOO MUCH PLANT GROWTH IS SUFFOCATING, TOO LITTLE CAN BE DEVASTING.
- IN SYNC WITH OTHER FEEDBACK SYSTEMS AN INCREASE OF CHLOROPHYLL A CAN BE BENEFICIAL IN SUPPORT OF A PLENTIFUL AND BALANCED FOOD SUPPLY

TEMPERATURE

➤ EVERYTHING IS CONNECTED.

➤ TEMPERATURE MEASURES THE AVERAGE KINETIC ENERGY OF THE ATOMS AND MOLECULES.

➤ WATER TEMPERATURE CAN AFFECT THE METABOLIC RATES AND BIOLOGICAL ACTIVITY OF AQUATIC ANIMALS

➤ INCREASE IN METABOLIC FUNCTION CAN BE NOTICED IN RESPIRATION RATES.

➤ INCREASE RESPIRATION RATES AT HIGH TEMPERATURES LEAD TO INCREASED OXYGEN CONSUMPTION.

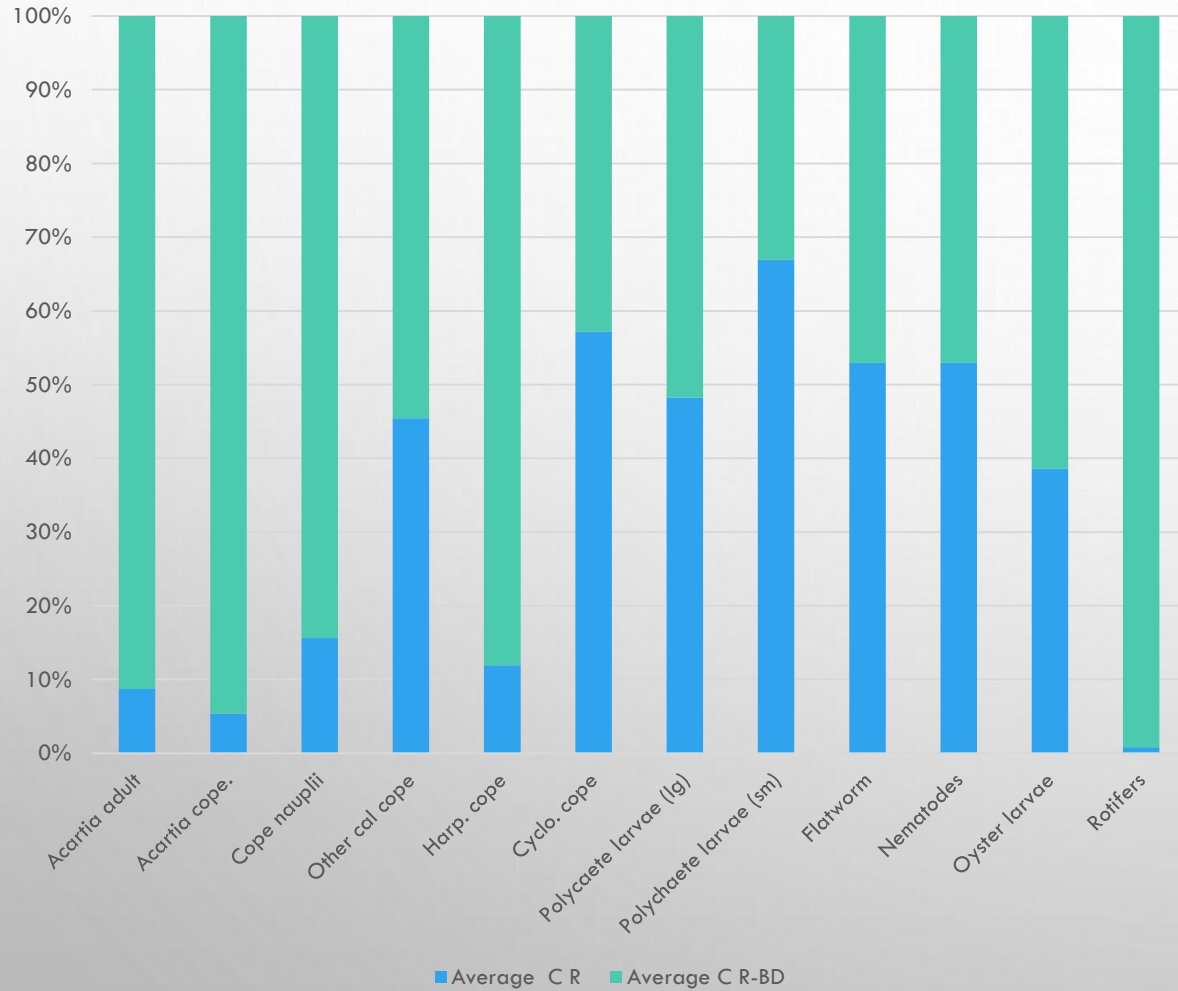
➤ TEMPERATURE FLUCTUATIONS CAN ALSO AFFECT THE BEHAVIOR OF CHOICES OF AQUATIC ORGANISMS SUCH AS MOVING TO WARMER OR COOLER WATER, PREDATOR-PREY RESPONSES, AND ALSO RESTING AND/OR MIGRATING ROUTINES.

➤ FLUCTUATIONS IN WATER TEMPERATURE CAN SHOW RESTRICTED GROWTH IN PLANTS AND INHIBIT RESPIRATION AND PHOTOSYNTHESIS.

TOTAL SUSPENDED SOLIDS

- EVERYTHING IS CONNECTED.
- TSS ARE ANY SUSPENDED SOLIDS MORE THAN 2 MICRONS.
- TSS CAN BE INORGANIC MATERIAL, DECOMPOSING MATERIAL, SAND DRIFTING OR FLOATING, PLANKTON, ALGAE, ETC.
- THE MORE TSS IN WATER THE LESS CLEAR THE WATER IS.
- HIGH LEVELS OF TSS WILL INCREASE WATER TEMPERATURE AND DECREASE DISSOLVED OXYGEN.
- TSS CAN INHIBIT PHYTOSYNTHESIS BY BLOCKING LIGHT.
- LESS PHYTOSYNTHESIS AND DISSOLVED OXYGEN PROMOTES DECOMPOSITION WHICH CAN DROP DISSOLVED OXYGEN LEVELS EVEN LOWER. SEAWEED AND UNDERWATER PLANTS ARE NECESSARY FOOD SOURCES FOR MANY AQUATIC ORGANISMS. THE DIE OFF OF THIS SUPPLY CAN CAUSE POPULATION DECLINES UP THE FOOD CHAIN.

Comparison of species carbon between R (Blue) and R_BD (Green)



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Acartia Adults	4.99	52.32	0.002
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