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Research article

How the Species Richness Changes in Rock Pools on the Swedish West Coast with Different Abiotic Factors?

Golam Kibria*

Centre for Environment and Climate Change Research (CECCR), Bangladesh

***Corresponding author:** Golam Kibria, Centre for Environment and Climate Change Research (CECCR), Bangladesh

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Abstract

Rock pools are very well defined and are therefore easy to study both in time and space. In this project study we measured species richness in natural rock pools of the algal and invertebrate communities, as well as the plankton community. We assumed, according to the "theory of island biogeography", that the distance to source populations, in this case the marine environment, determines the number of species found in a specific rock pool. We thought that abiotic factors like the distance to the sea, the surface area and the depth of the rock pools as well as the fetch (the exposure to the winds and waves from the sea) and the salinity would influence the species richness (number of taxa) of the rock pools. First, correlation between different abiotic factors was tested and none of the factors were found correlated to each other. For statistical analysis of the data, multiple linear regression analysis was chosen, and the results showed that the shorter distance to the sea and the higher the surface area, significantly affected the salinity of the rock pools, and the salinity significantly affected the species richness (3 ppm higher salinity in aver-age had an increase with 1 species at a rock pool). Although fetch itself didn't have any direct significant effect, the fetch divided by the distance to the sea significantly affected species richness. Also, we tried to estimate what influence biotic factors (like the functional group of the species in the rock pool, or the presence of key species and foundation species) had for the species richness but found this be too big effort within our frames.

Keywords: Natural rock-pools; multiple linear regression analysis; plankton diversity; ecosystem

Introduction

On islands around Tjärnö on the Swedish west coast there are a lot of natural rock-pools. Rock pools are very well defined and are therefore easy to study both in time and space. The inflow and outflow are limited, and therefore the plant, animal and plankton community within them could be measured. In this project we wanted to measure species diversity of the algal and invertebrate communities, as well as the plankton community, in natural rock pools. The dispersal of organisms in fragmented habitats con nects spatially separated local populations, like from the sea to a rock pool. The rate of dispersal probably occurs at different rates for different taxa, shows a study of freshwater rock pools [1]. The dispersing organisms are also engaged in trophic interactions, and the different dispersal among taxa of different trophic levels has the potential to strongly influence spatial food-web dynamics. Species richness is simply a count of species, and it does not take into account the abundances of the species. Species diversity takes into account both species richness and species evenness.

In this project we first tried to estimate the abundance, but then decided to limit our study only to species richness. MacArthur and Wilson's "theory of island biogeography" [2] is a very well-known explanation for species richness, and helps to understand the species-area relationship. The island biogeography theory states that the distance of the island to the mainland and the size of the island has an impact on the colonization and species richness. The bigger the island is, and the shorter the distance to mainland is, would result in higher species richness. This classic theory can be extended to take into account trophic interactions, which implies that the properties of the regional food web influence the species-area relationships [3]. As the trophic rank increases (higher up in the food-web), the stronger should be the species-area and species-distance effects [4]. Though there are some cases when there are no such expected effects.

In this project we wanted to test the relative importance of local and landscape-scale factors for the ecosystem structure. In our case we wanted to test if this theory also could be relevant for the colonization and species richness amongst marine rock pool flora and fauna. If the rock pool was large and the sea was in short distance from it, in theory one would expect a higher species richness if compared to a smaller and more distant rock pool further up on land. We assumed, according to the “theory of island biogeography”, that the distance to source populations (e.g. the mainland, or in this case the marine environment) determines the number of species found at the island (in this case a specific rock pool with water). We further looked for different factors possibly influencing the species diversity and the structure and function of local communities. There could be biotic and abiotic factors. Other abiotic factors than the distance to the sea could influence the species diversity of the rock pools, like the surface area and the depth of the rock pools, the distance to other rock pools as well as the salinity and temperature of the rock pools.

Biotic factors could be biotic interactions, like the functional group of the species in the rock pool (e.g. primary production, herbivory or predation) or the presence of key species and foundation species. One factor that also could be influential for the colonization and which we also wanted to test was the grade of exposure to wind and waves. If the rock pool were situated in a more exposed island or on the side of an island that were more exposed, in theory this could be beneficial and help marine organisms to colonize that rock pool. If grade of exposure had any influence, we also wanted to investigate this by measuring the fetch (see below). During our investigations we chose to look into different sized rock pools and at different distances to the seawater and count the number of species both macroscopically (species visible for the eye) and microscopically, when we did take the samples back to laboratory for further investigations in higher magnification. Estimates of community metabolism in some Baltic brackish water rock pools revealed that photosynthesis exceeded respiration throughout the year in spite of a high nutrient load and a limited exchange of water with the sea [5].

This suggests that rock pools often have high productivity and then possibly could harbor great species diversity. The hypothesis we tried to address in this project was if we could find any positive effects of local abiotic and biotic factors on the species diversity of the rock pools at the west-coast of Sweden. We assumed that higher salinity had a positive effect, that a shorter distance to the sea had a positive effect, that a greater pool surface area had a positive effect and that a greater fetch (the exposure to winds and waves from the sea) had a positive effect for the species diversity. We thought that the surface area of a rock pool and the distance to the sea would influence the salinity of the rock pools, which then in turn would influence the species diversity.

Materials and Methods

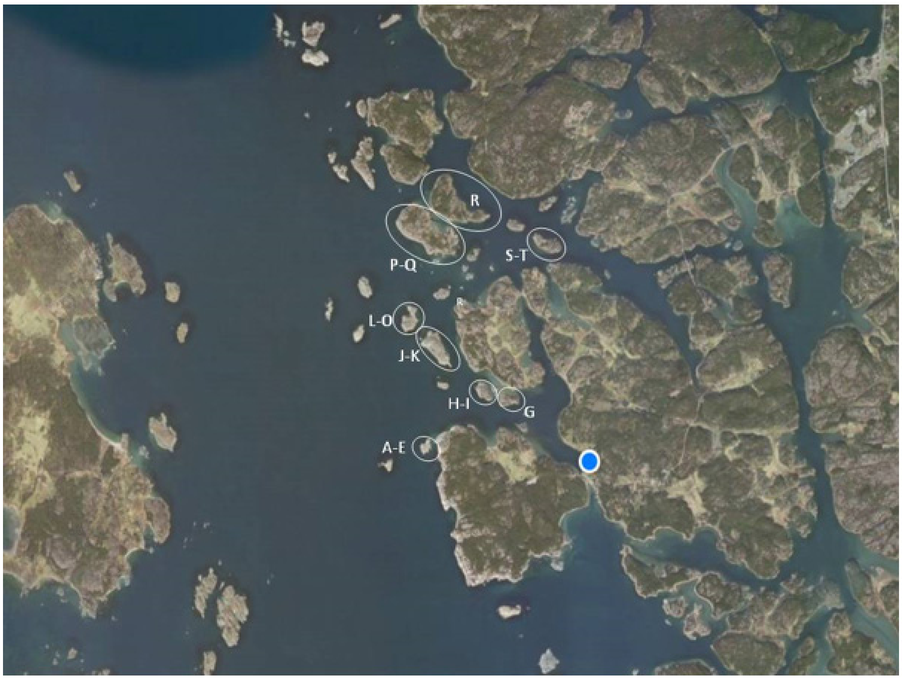

Figure 1: Map of sampling sites around Tjärnö (marked with a blue dot), each island is marked with a circle. Rockpool A to T have been marked in the figure at the island were the sample have been taken.

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To estimate and identify what factors affects the species diversity in rock pools at the Swedish Westcoast, we had to measure several factors. We assumed factors like the surface area of the rock pools, the distance to the water from the rock pools, the salinity of the rock pool, the level (height) above sea surface, and the fetch (grade of exposure to the winds and waves from sea) of the rock pools would be most influential on the rock pool species diversity. We planned our expeditions, which we performed with a small motorboat, to the different small islands around Tjärnö, with maps over the archipelago from the Koster national park. There were 19 rock pools in total during a period of 5 days. We tried to examine both rock pools that were exposed to the sea and sheltered ones to be able to compare the results from different sized pools and different grade of exposure to sea influence. Our field investigation did visit 8 islands west, and north-west of Tjärnö island (marked with blue dot in the map in Figure 1).

The investigation started on July 23rd by sampling at Inre Vattenholmen (rockpool A-E) and continued on July 24th of July at Inre Tenskär (rockpool G), Yttre Tenskär (rockpool H, I), Långholmen (rockpool J, K) and Lökholmen (rockpool L). The following week we on July 27th for the second time visited Lökholmen (rockpool M, N, O) for further investigations and continued to Yttre Burholmen (rockpool P, Q), Inre Burholmen (rockpool R) and Trollholmen (rockpool S, T). We first measured the distance from the rock pools to the water, both the real distance (nearest rock pool was 0.1m from the water) and the horizontal distance to the water (both these measurements with a long measuring tape), and also the height from the rock pool to the estimated sea level (with a 4 m measuring stick, that were foldable in middle). In each rock pool we did ten measurements of the depth and then calculated the average depth.

The surface areas of the rock pools were measured with a measuring tape and later calculated using estimates of triangles, rectangles and squares. We also measured the salinity in the rockpool using a salinity meter, with fresh water as a control and comparing with sea water salinity. We then made an examination of the species diversity in the rock pools, both of the macroalgae and the invertebrates, and took plankton from the plankton communities. We brought specimens of the unknown algae and invertebrate species to the Sven Lovén Center for Marine Sciences at Tjärnö for examination. We directly tried to estimate the coverage of the macroalgae and invertebrates in percentage of the whole rock pool at each site. For the collection of plankton, we sampled approximately 2.1 liters of water using a cylindric plastic tube that was closed at bottom using a rubber plug. Each sample of rock pool water contained 350 ml of water (sampling repeated 6×350ml = 2.1 liter).

The plankton was brought back in small pots placed in a cooling bag, and we later examined the plankton under microscopy in the laboratory. Fetch is a variable that describes the level of exposure to the sea (the impact of winds and waves and the possible input from the sea to the rock pool of marine species). To calculate the fetch, the distance X to the first island was estimated on a map, in the direction of the "shore normal" of the rock pool to the sea (straight out towards sea horizon from the rock pool). The angle α from the shore normal from the rock pool to the sea, 90º to the right and 90º to the left, with 10º interval, was also included in the equation to be calculated. The fetch was then calculated according to the equation:

$$Fetch = \Sigma(X^{*} \cos \alpha) / \Sigma(\cos \alpha)$$

The results were analysed and treated statistically in Excel and the statistical software R. The rock pools have different variable factors which are assumed to be causal effects for one variable i.e. number of plants and animal species found in the rock pools. With these circumstances multiple regression analysis was chosen for statistical analysis of the data. Before putting data into analysis correlations among different variables were tested and none of the factors were found correlated to each other. Correlation values were found as; Fetch and salinity (-0.05), Distance and Fetch (0.3), Area and Fetch (-0.18), Distance and Area (0.02), Salinity and Area (0.4), Salinity and Distance (-0.5). As none of the factors were correlated to each other, all these factors were added to the statistical analysis.

Results

In total around 42 macro-Species (flora and fauna) were found (Appendix 2) in pool A-T. Highest number of macrospecies i.e. 17 species was found in pool L and P, whereas there were no macrospecies found in pool O and Q (Figure 2A). In regard to phyla, the pools were dominated by 8 species of Mollusca, 5 species of Chlorophyta, 2 species of Bryozoa, 5 species of Phaeophyta, 10 species of Arthropoda and 8 Species of Rhodophyta (including duplication of some species in different pools). The plankton diversity of the rock pools was also rich enough (Figure 3). In total about 55 species of plankton were noted in Pool A-T (Appendix 1-3). More species were found in pool A (16 species), I (11 species) and M (11 species). Most abundant plankton are 14 species of *Bacillariophyceae*/Diatoms, 15 species of *Dinophyceae* and 7 species of Ciliata/Rotatori (Figure 4). Multiple linear regression analysis shows that both surface area (P=0.05) and distance (P=0.009) of rock pools from sea water have significant effects on salinity of rock pool's water.

It has been calculated that an increase of 1 m2 surface area salinity increases 0.5 ppm, whereas an increase of 1 m distance of rock pools from sea water decreases 0.8 ppm of salinity (Figures 4&5). Salinity of rock pool's water (P=0.0003) has a significant effect on abundance of macro flora and fauna. It is found that an increase of 1 ppm salinity increases 0.3 species (Figure 6). Though salinity affects abundance of macro species, salinity itself is influenced by distance and surface area of rock pools from sea water. Rock pools which are closer distance to the sea water have been found to have high salinity (Figure 5), whereas rock pools with larger surface area have been found to have high salinity (Figure 4). Surface area and distance don't have any direct effect on abundances of macro flora and fauna. As salinity of rock pool's water is influenced by distance and surface area it can be said that these two factors have indirect effects on abundances of macro flora and fauna (Figures 7&8). Multiple regression analysis also shows that surfaces area of rock pools tend to have a direct positive effects on abundances of macro flora and fauna.

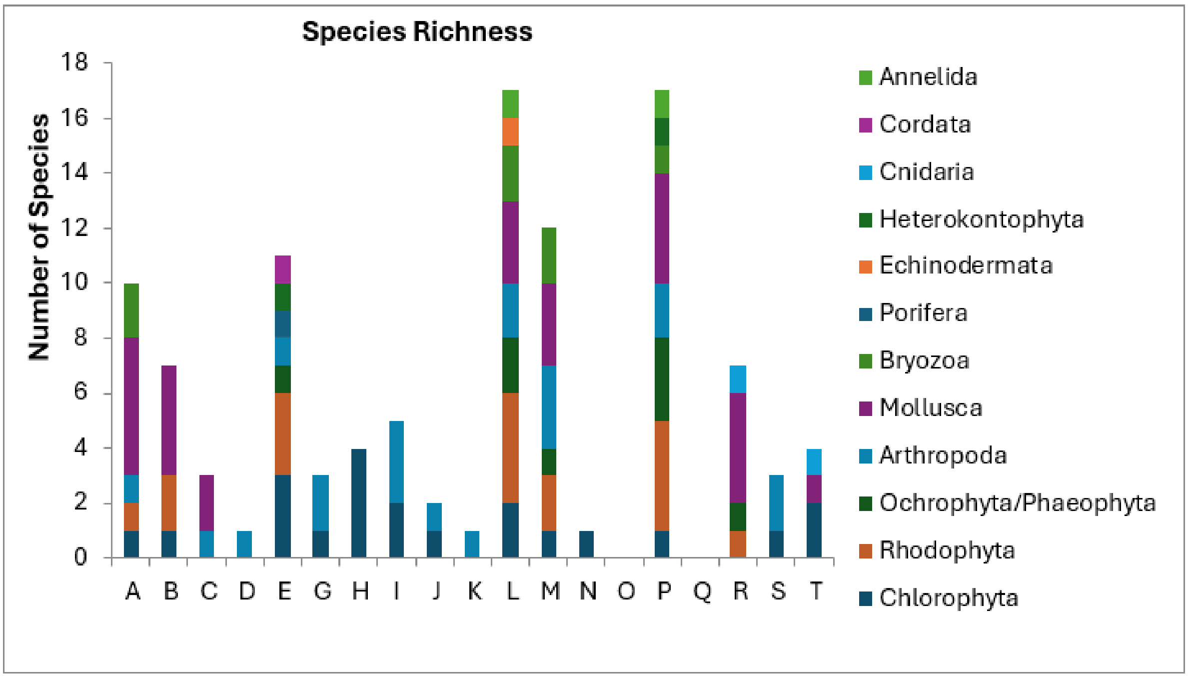

Figure 2A: The plant and animal species richness in the rock pools A-T, according to higher taxa (phyla).

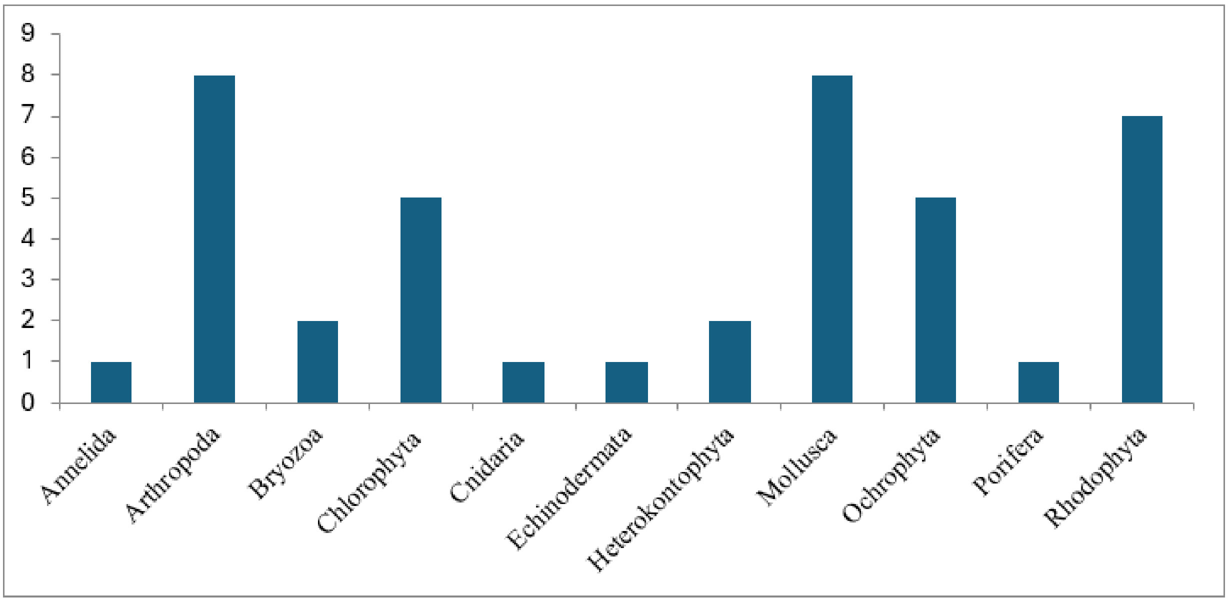

Figure 2B: Macroflora and macrofauna phyla found in rock pool A-T.

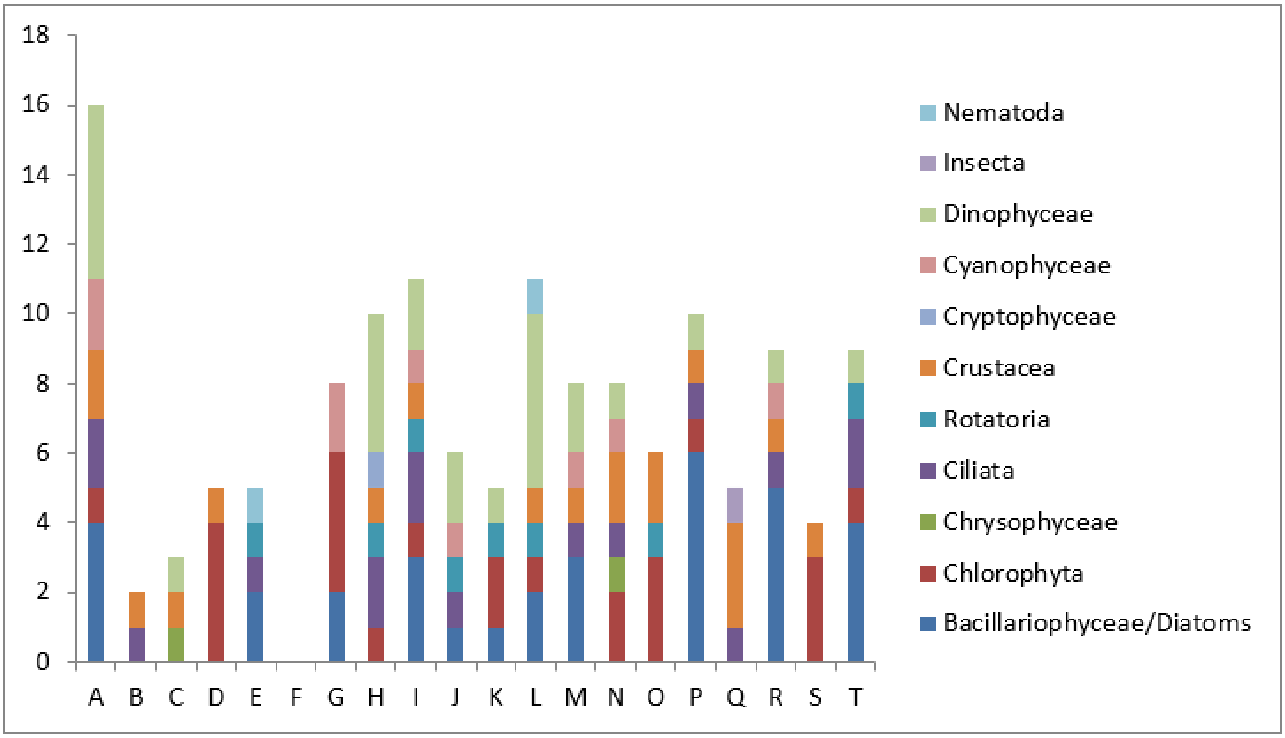

Figure 3A: Plankton species richness in the rock pools A-T, according to phyla (or other higher taxa).

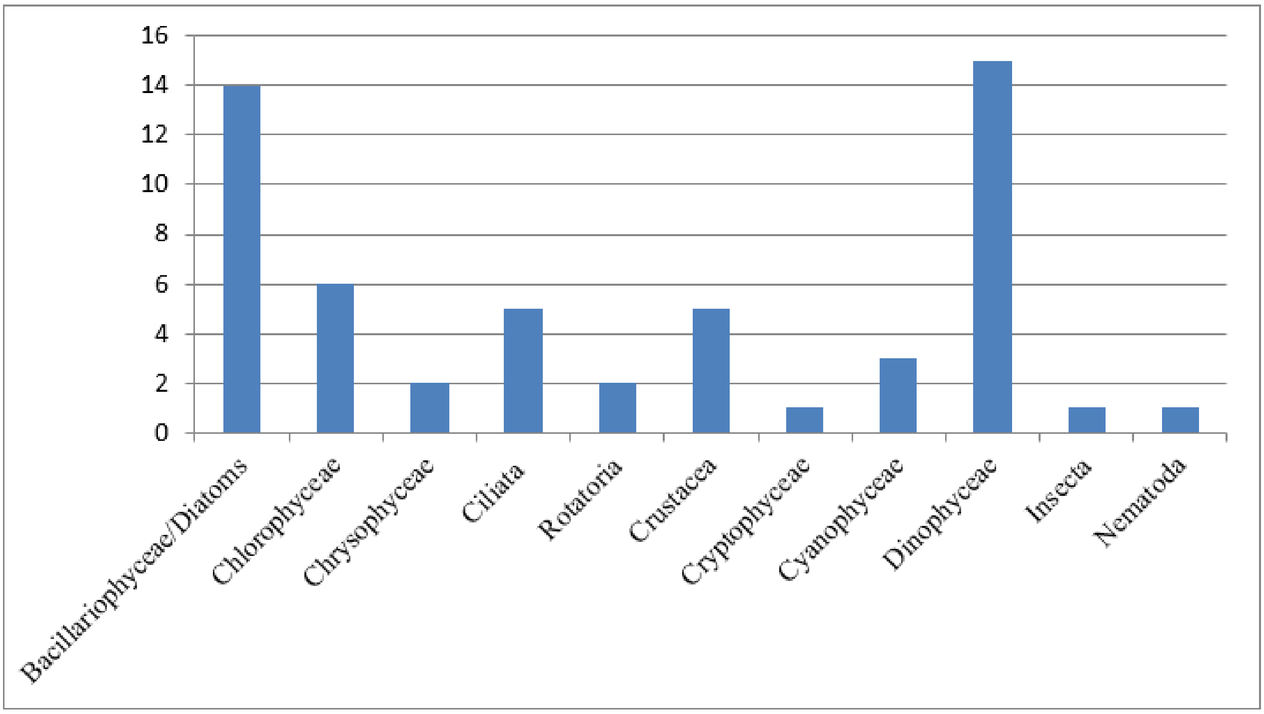

Figure 3B: Plankton species/genus found in the rock pools.

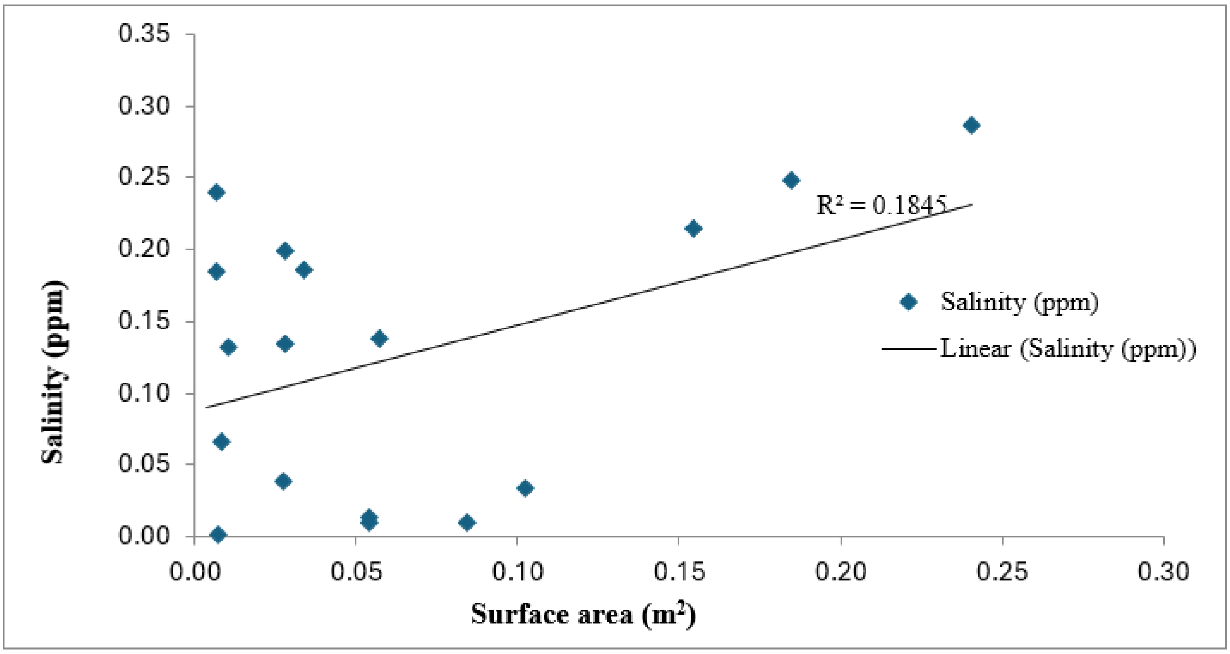

Figure 4: Effect of surface area of rock pools on salinity.

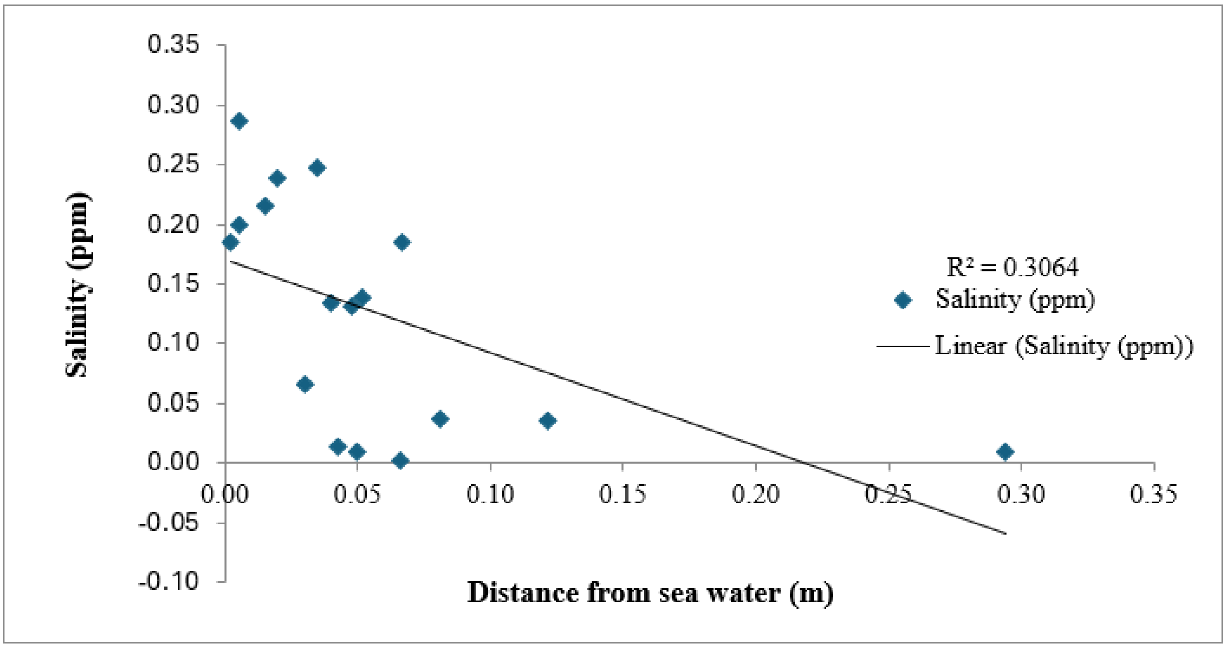

Figure 5: Effects of distance of rock pools from sea water on salinity.

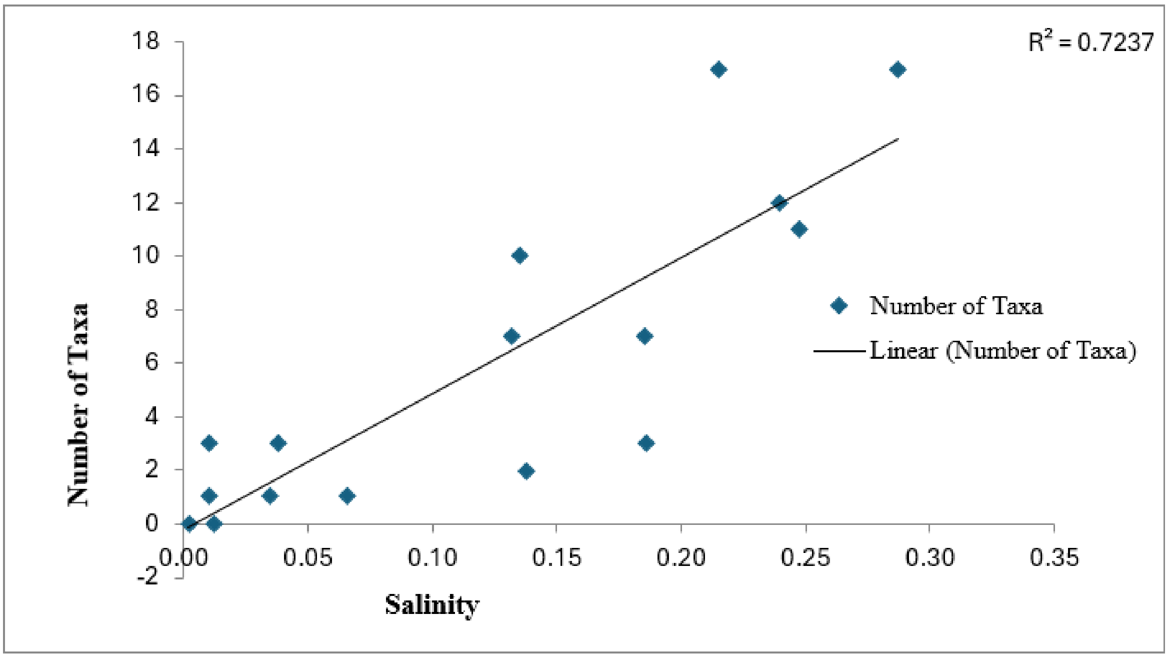

Figure 6: Effects of salinity on species richness of macro species.

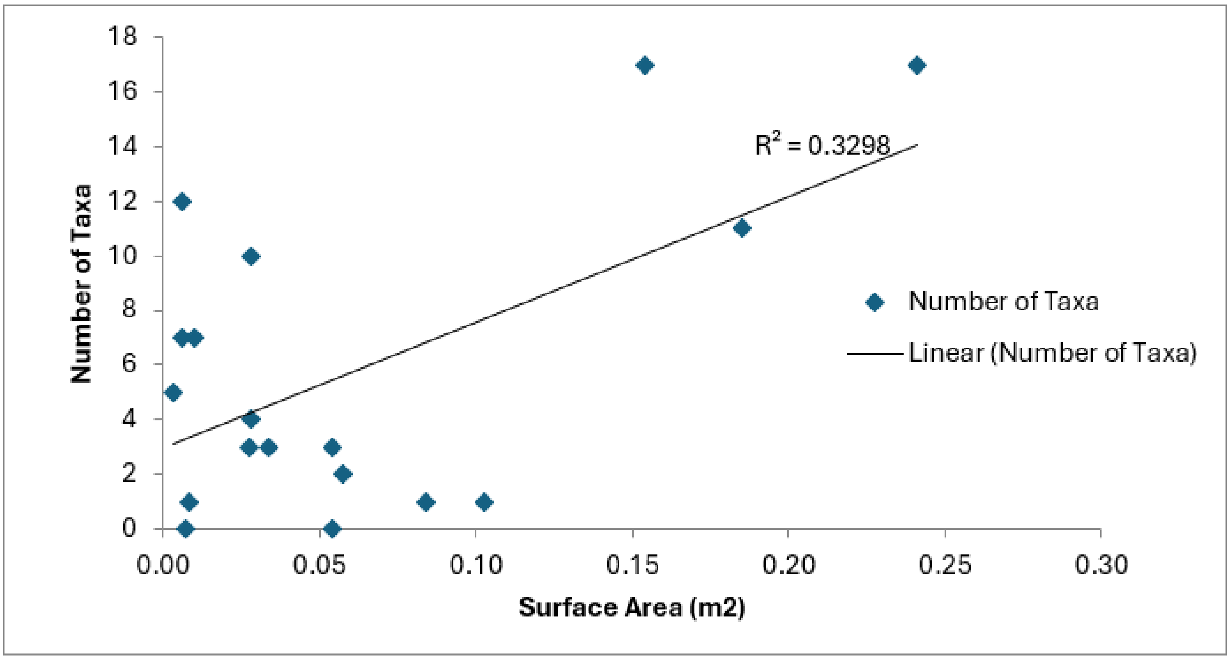

Figure 7: Indirect effects of surface area of rock pool on the species richness of macro species.

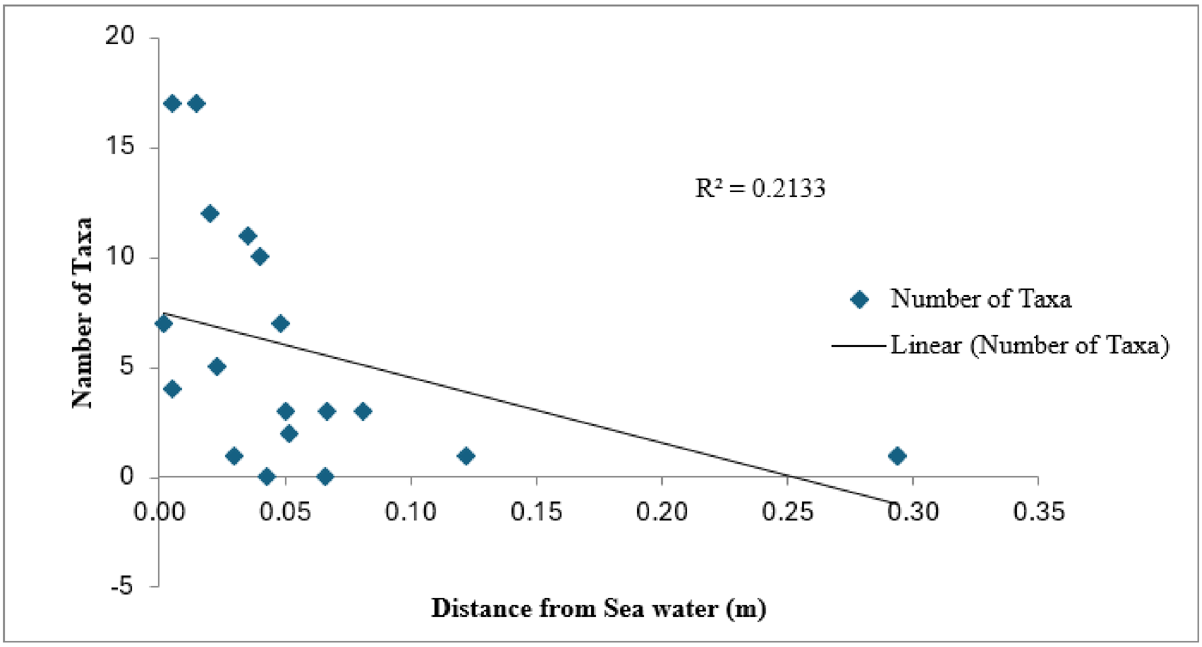

Figure 8: Indirect effects of distance of rock pools from sea water on species richness of macro species.

Effects of fetch on different rock pools were also calculated in R. Unfortunately, fetch doesn't have any direct effects on abundance of macro fauna and flora. Although fetch doesn't have any direct effect, it can be assumed that distance and fetch together might have some indi-rect effects on abundance of macro fauna and flora. Rock pools A-D were located in the same island with the same fetch but with variable distance from sea water (Figure 9). These rock pools have variable species abundance. It has been found that species abundance is significantly affected (P=0.0006) with byproduct of fetch values divided by distance (Figure 9). However, finally it is found that only salinity has significant direct effect on the abundance of macro species. Surface area, distance and by product of fetch values from distance have indirect effects on abundance of species (Figure 10). On the other hand, all factors of rock pools i.e. surface area, distance, salinity and fetch were tested to check their response on the abundance of plankton communities, but none of the factors have been found to affect significantly to the abundance of plankton.

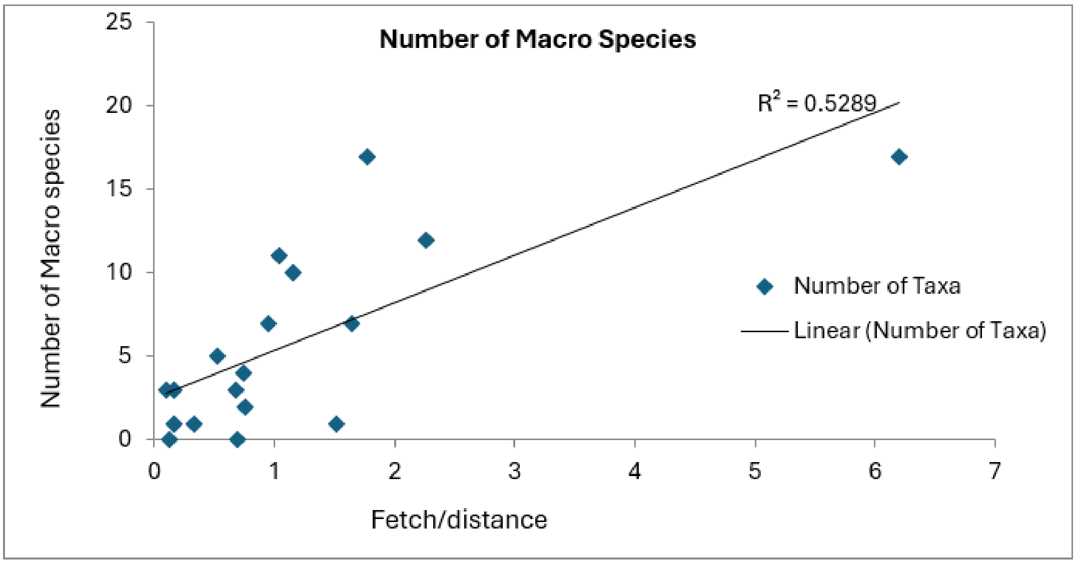

Figure 9: The indirect effects of fetch and distance of rock pools for species richness of macro species.

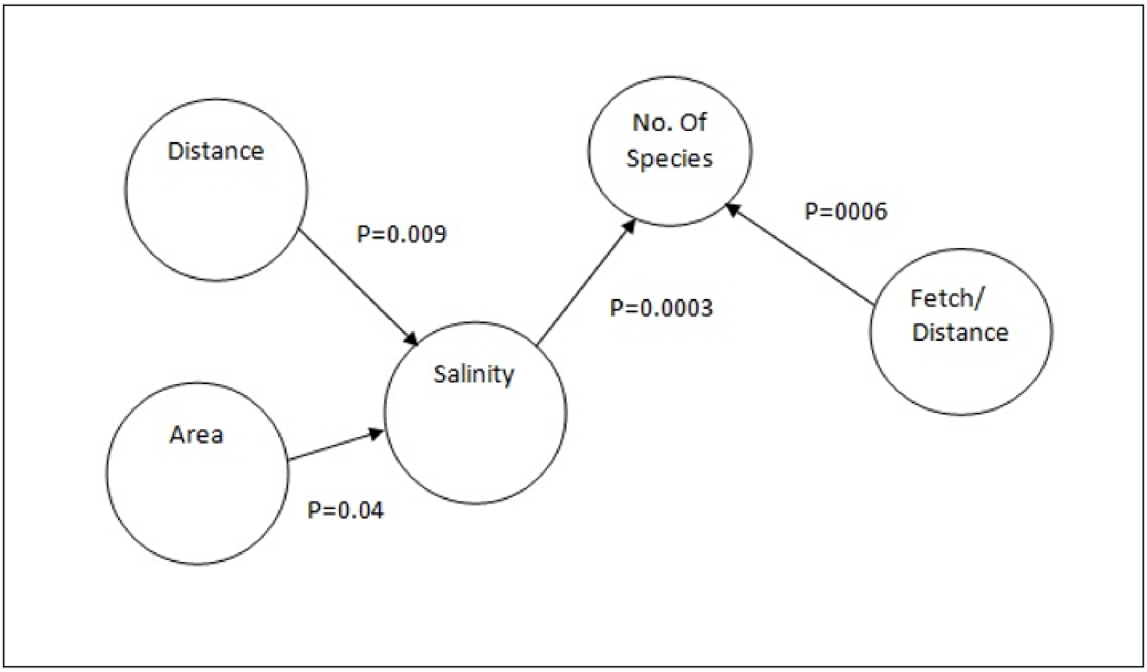

Figure 10: The effects of all factors on rock pools for species richness for macro species.

Discussion

A study showed how a simple island-biogeographical model explained 62% of the variation in local macro-invertebrate species richness of 47 neighboring pools in Israel, based on pool size and permanence (desiccation rate) [6]. Another study of macroalgal communities in 38 littoral rock pools at the coast of Portugal showed that species richness increased from higher situated rock pools to lower situated. The results also suggest that each pool was unique in its community structure [7], and that the environmental (abiotic) factors do not determine the variability between pools. Yet another study tested the "theory of island biogeography" for microorganisms (spring diatoms) in 50 boreal springs in Finland. According to the theory, species richness in island-like systems (like in this case the ocean sea and a rock-pool) is determined by ecosystem size and isolation [8]. The results though found no support for species-area or species-isolation relationships.

In our study we have not been able to confirm statistically that the size and distance of the rock pool from the sea have an effect on the species richness. What seems to be influential is the level of salinity in the rock pool. But this is also affected by the area of the rock pool and the distance to the sea. So indirectly we can see that these factors still affect the species' richness. When looked at the grade of exposure and the calculated value of fetch there was also no direct effect that could be verified. However, if you used fetch and divided this with the distance to the sea we saw a correlation to the species richness. This was also clear if you looked at different pools on the same side of the island, Inre Vattenholmen where the species richness amongst macroscopic plants and invertebrate animals decreased by the increased distance to the sea. (Figure 2, bars for rockpool A-D). Marine rock pools are heterogenic small ecosystems with lower species diversity compared to the nearby open coastal marine waters. In the coastal waters organisms are moving freely and will also continuously be mixed and dispersed by currents and waves.

This in contrast to the shallow rock pools with a more or less isolated environment that offers a sheltered place with lower predatorily competition and that often also have a physically calmer environmental compared to the shallow coastal areas from where many of these species originates. These small ecosystem communities with fewer interacting species make it possible for more simplified studies worldwide on marine ecosystem and species interactions. Several studies have used this fact. Studying these smaller communities with only a few species present makes it possible to follow species interactions on a smaller scale. However, weather conditions and transport of seawater can cause sudden changes that have strong effects on these microhabitats. One such abiotic factor is the salinity that can change from high to low in short periods due to heavy rainfalls or to the opposite with increased salinity due to wind and sun driven dry outs. During winter in Sweden many of the rock pools suffer total bottom freezing which drives the ecosystem to a collapse and influences a restart of these microhabitats next spring. Many of the ecosystems have in these cases a short-lived life history.

The sudden changes of the abiotic factors in the micro ecosystems are challenging to its inhabitants. High stress levels and wide ranges in the values of different abiotic factors forces the species in these communities to use several survival strategies. These species have to be very plastic and make continuous adaptations in the fight to withstand these changes. In our study we have seen some indications on how these strategies can look like. In the planktonic ecosystem of rock pool J, we noticed a community that lacked larger predators such as Gammaridae or Harpacticoid copepods. The community was instead dominated by one free-living and predatory Rotifer species (*Trichocera sp.*) that were attacking smaller plankton species. Rotifer species are often specialized in filtering the water and eating phytoplankton and dead particles since only smaller particles can be taken up by their small mouth. In the samples from this rock pool, we observed resting egg cells inside live Rotifers and also freely embedded in detritus material.

See Figure 11. These Rotifer eggs are example of an interesting life history that are unusual for many animals but give the rotifers have a very fast reproduction rate that outnumbers many other invertebrate species. Some rotifer communities consist often only of females. Those species reproduce by pathogenesis which means that they produce diploid eggs asexually. In the case of *Trichocera sp*. they show another adaptation with dimorphic reproduction where the females are larger and produce eggs internally. The males are smaller and do not eat anything and are short-lived. Their main goal is to fertilize females before they die. These fertilized eggs develop then into a resistant zygote that can survive if the rock pool dries up. The eggs hatch when they are released into to water by the female or when the rock pools are refilled from new water supplies (Figure 11). Another interesting example of how to survive in this rock pool and withstand rapid changes is shown by some Ciliate species. If the environment is unfavorable the *oligotrichid ciliate Strombidium sp*. can develop a dormant – a resting and resistant life stage.

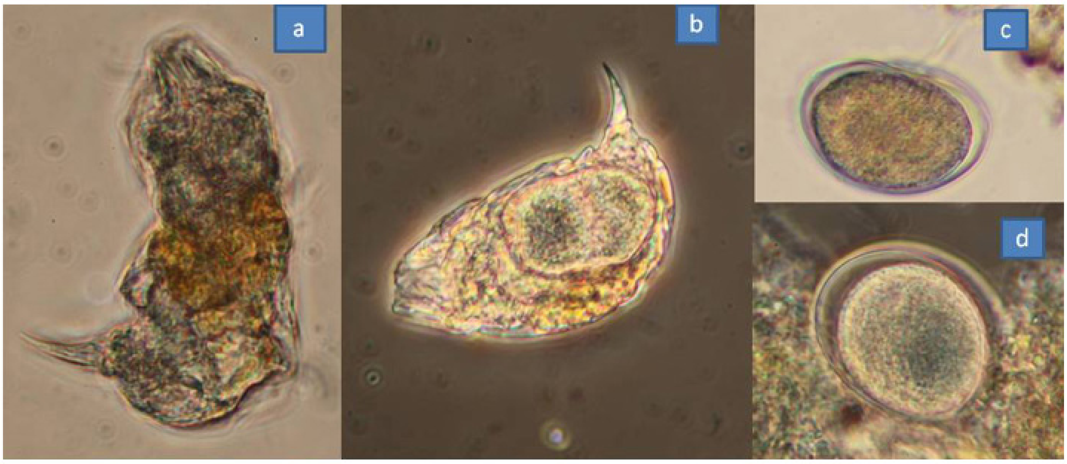

Figure 11: Different stages of the rotifer specie Trichocerca sp. a) live female, b) resting female with developing egg inside the body, c and d) released eggs before hatching. Photo Anders Alfjorden.

These spore stages make it possible for them to survive dry outs or other challenges. The spore stage could withstand these changes and make it possible to survive dormant in another lifeform. This has been described in some of these ciliate species such as *Strombidium biarmatum* [9] and *Strombidium oculatum* [10]. Studies on coastal rock pools from Swedish waters have been presented by different scientists. One study by Björn Ganning published 1971, online in 2012 describes many of the mechanisms known from Swedish waters. In his article "Studies on chemical, physical and biological conditions in Swedish rock pool ecosystems, he points out several observations [11]. The physical and chemical factors of the rock pools are very variable in salinity, temperature, oxygen, and pH. These important parameters are not only regulated by the climate and seawater but also by the population density and algal growth. Salinity is an important factor but in Baltic rock pools other parameters such as temperature, oxygen and pH can be extremely variable and therefore also are important factors to observe.

In our study we made observations the first day of sampling (23 of july) at Inre vattenholmen that give further support to Gannings study and gave us an example of some of these processes. In one rock pool close to pool E we observed an ongoing dry out. During the first week on Tjärnö we had already visited the island to study plants and animal life in the sea. At that time, we observed schools of sticklebacks in some of the rock pools on the sheltered side of this island. One week later when we started our rock pool investigations: wind and sunshine had resulted in outcasts of salt on the edges of several of these rock pools. Salt crystals surrounded several pools giving them a rim of whiteness. In one pool some sticklebacks (Gasterosteus aculeatus) had tried to flee from this hot shallow pool but were trapped in an even smaller pool with only limited amounts of water. This resulted in mortalities of a school of sticklebacks before our arrival at the island. See Figure 12. Ten (10) newly dead sticklebacks were found in this small and shallow rock pool, temperature was also high but could not measure. Around this rock pool there is a clear rim of salt crystals indicating an ongoing situation of drought.

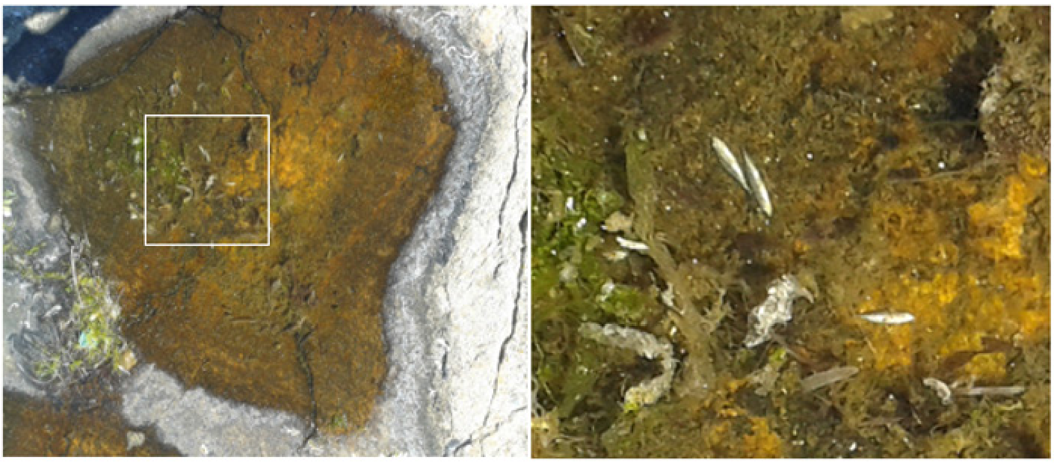

Figure 12: Rock pool with high salinity values: measured to: 4.2% NaCl. Ten (10) newly dead sticklebacks were found in this small and shallow rock pool, temperature was also high but could not measure. Around this rock pool there is a clear rim of salt crystals indicating an ongoing situation of drought.

Acknowledgements

Thanks to Stockholm University for organizing the field trip as part of the Marine Biology summer course 2015. This is a project report of that course. Thanks to Sven Lovén marine biology station at Tjärnö for laboratory facilities, boat and accommodation. Also thanks to our supervisors Annie and Johan who gave us strong support and good criticism.

Data availability

Due to confidentiality agreements, supporting data can only be made available to bona fide researchers subject to a non-disclosure agreement. Data request can be made to the corresponding author.

APPENDIX

Appendix 1: Plankton species list.

Plankton (genus or species)	Phyla or other higher taxa
Aktinocyclus sp	*Bacillariophyceae*/Diatoms
Amphora sp	*Bacillariophyceae*/Diatoms
Asterionellopsis sp	*Bacillariophyceae*/Diatoms
Bacillariophyceae/Diatoms	*Bacillariophyceae*/Diatoms
Chaetoceros sp	*Bacillariophyceae*/Diatoms
Cyclotella sp	*Bacillariophyceae*/Diatoms
Dactyliosolen	*Bacillariophyceae*/Diatoms
Dethonula sp	*Bacillariophyceae*/Diatoms
Gyrosigma sp	*Bacillariophyceae*/Diatoms
Leptocylindros sp	*Bacillariophyceae*/Diatoms
Nitzchia sp	*Bacillariophyceae*/Diatoms
Pleurosigma sp	*Bacillariophyceae*/Diatoms
Pseudonitzschia sp	*Bacillariophyceae*/Diatoms
Stephanopyxis turris	*Bacillariophyceae*/Diatoms
Actinastrum sp	*Chlorophyceae*
Coelastrum sp	*Chlorophyceae*
Oocystis sp	*Chlorophyceae*
Pediastrum sp	*Chlorophyceae*

Scenedesmus sp	*Chlorophyceae*
Chlorophyceae	*Chlorophyta*
Chrysophysean cysts	*Chrysophyceae*
Dinobryon sp	*Chrysophyceae*
Astylozoon sp	*Ciliata*
Ciliata	*Ciliata*
Euplotes sp	*Ciliata*
Helicostomella sp	*Ciliata*
Parafavella sp	*Oligotrichid (Ciliata)*
Trichocerca sp1.	*Monogononta (Rotifer)*
Trichocerca sp2.	*Monogononta (Rotifer)*
Cladocera, Daphnia sp	*Crustacea*
Cladocera, Podon sp	*Crustacea*
Copepoda, Harpacticoida	*Crustacea*
Copepoda, Nauplius larvae	*Crustacea*
Gammarus sp	*Crustacea*
Plagioselmis sp/Teleaulax sp	*Cryptophyceae*
Oscillatoria sp	*Cyanophyceae*
Planktolyngbya sp	*Cyanophyceae*
Romeria sp	*Cyanophyceae*
Alexandrium sp	*Dinophyceae*
Ceratium sp	*Dinophyceae*
Ceratium fusus	*Dinophyceae*
Ceratium lineatum	*Dinophyceae*
Ceratium macroceros	*Dinophyceae*
Ceratium tripos	*Dinophyceae*
Dinophysis sp	*Dinophyceae*
Dinophysis norvegicus	*Dinophyceae*
Diplosalis sp	*Dinophyceae*
Gymnodinium sp	*Dinophyceae*
Gyrodinium sp	*Dinophyceae*
Heterocapsa sp	*Dinophyceae*
Micracanthodinium sp	*Dinophyceae*
Oxyrrhis sp	*Dinophyceae*
Protoperidinium sp	*Dinophyceae*
Culicidae larvae (Diptera)	*Insecta*
Nematoda	*Nematoda*

Appendix 2: Macro species list.

Species	Phylum
Spirorbis spirorbis	*Annelida*
Balanus improvisus	*Arthropoda*
Balanus crenatus	*Arthropoda*
Balanus sp	*Arthropoda*
Gammarus gammarus	*Arthropoda*
Heterropotera	*Arthropoda*
Insect larvae	*Arthropoda*

Ligia oceanica (Isopoda)	*Arthropoda*
Semibalanus balanoides	*Arthropoda*
Daphnia sp	*Arthropoda*
Electra pilosa	*Bryozoa*
Membranipora membranacea	*Bryozoa*
Cladophora glomerata	*Chlorophyta*
Spongomorpha aeruginosa	*Chlorophyta*
Ulva intestanalis	*Chlorophyta*
Ulva lactuca	*Chlorophyta*
Enteromorpha ahlneriana	*Chlorophyta*
Sagartiogeton undatus	*Cnidaria*
Psammechinus miliaris	*Echinodermata*
Saccarina latissima	*Heterokontophyta*
Sargassum muticum	*Heterokontophyta*
Crassostera gigas	*Mollusca*
Littorina fabalis	*Mollusca*
Littorina littorea	*Mollusca*
Littorina saxatilis	*Mollusca*
Littorina sp	*Mollusca*
Modiulis modiulis	*Mollusca*
Mytilus edilus	*Mollusca*
Nassarius nitidusa	*Mollusca*
Nassarius reticulata	*Mollusca*
Corda filum	*Ochrophyta*
Fucus evanescens	*Ochrophyta*
Fucus seratus	*Ochrophyta*
Fucus spiralis	*Ochrophyta*
Fucus vasiculatus	*Ochrophyta*
Halichondria panicea	*Porifera*
Bonnemaiesonia hamifera	*Rhodophyta*
Brown filamentous algae	*Rhodophyta*
Ceramium sp	*Rhodophyta*
Chondrus crispus	*Rhodophyta*
Dumontia contorta	*Rhodophyta*
Hildenbrandia rubra	*Rhodophyta*
Polysiphonia	*Rhodophyta*

Appendix 3: Abiotic factors and species richness.

	Number of Taxa	Area (m^2)	Distance from sea water (m)	Salinity (ppm)	Plankton	Fetch	Fetch/ Distance
Pool A	10	2,79	4,00	13,50	16	4,59	1,15
Pool B	7	1,00	4,80	13,20	2	4,59	0,95
Pool C	3	3,40	6,70	18,60	3	4,59	0,68
Pool D	1	8,40	29,40	1,00	5	4,59	0,16
Pool E	11	18,49	3,50	24,80	12	3,66	1,04
Pool G	3	2,78	8,10	3,80	8	1,26	0,16
Pool I	5	0,34	2,30		11	1,19	0,52

Pool J	2	5,76	5,20	13,80	6	3,98	0,76
Pool K	1	10,26	12,20	3,50	5	3,98	0,33
Pool L	17	24,09	0,50	28,70	11	3,10	6,2
Pool M	12	0,62	2,00	24,00	8	4,35	2,26
Pool N	1	0,86	3,00	6,60	8	4,35	1,51
Pool O	0	0,70	6,60	0,20	11	4,35	0,69
Pool P	17	15,40	1,50	21,50	10	0,53	1,77
Pool Q	0	5,44	4,30	1,30	5	0,53	0,12
Pool R	7	0,63	0,20	18,50	9	0,33	1,65
Pool S	3	5,44	5,00	1,00	4	0,52	0,1
Pool T	4	2,79	0,50	20,00	9	0,37	0,74

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