Investigating the behavior of the invasive marine species the Japanese Oyster Drill (*Ocinebrellus inornatus*): Food preference, and Behaviour

First Draft

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INVESTIGATING THE BEHAVIOUR OF THE INVASIVE MARINE SPECIES THE JAPANESE OYSTER DRILL (*OCINEBRELLUS INORNATIS*), FOOD PREFERENCE AND BEHAVIOUR

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PREFACE

The basis behind this research is to gain a deeper insight into the still quite unknown yet very invasive marine species, *Ocinebrellus inornatus*, also known as the Japanese Oyster Drill. Ongoing research is continuously being conducted by the research group Aquaculture, under HZ University of Applied Sciences, which aims to understand their behaviour, physiology, phenology, nutrition, reproductive biology, and water tolerances, all of which are important factors in knowing how to cope with the impacts this species has on Oyster farming, the economy, and biodiversity.

I would have not been able to accomplish this research without the help of a strong core research group. Firstly, my supervisor Eva Hartog, who has played a significant role throughout the research process, providing immense guidance along the way, and my research group colleagues. Thank you all for your unwavering support throughout the entire duration during this research.

SUMMARY

The Japanese Oyster Drill (*Ocinebrellus inornatus*) was first spotted off the coast of France in 1995, and has since then by means of transportation and importing of oysters has brought them into the Netherlands, being first spotted in Gorishoek in 2007. Two species of Oyster drills are present in the Netherlands, The American Oyster drill (*Urosalpinx cinerea*), and the Japanese Oyster drill (*Ocinebrellus inornatus*), which will be the main focus of this dissertation. Since the first spotting of the Japanese Oyster drill in off the coast of the Eastern Scheldt, it has two primary locations that it calls "home", Lake Grevelingen and Yerseke. The Japanese Oyster drill is an invasive species because it has no natural predators found in the Netherlands, it is suspected that it arrived by import from a ship. Ever since its initial introduction in 2007 in the Netherlands, *Ocinebrellus inornatus*, or commonly there known as the Japanese Oyster drill has become a real nuissance and problem for the economy, and oyster farms. It is incredibley difficult to control an invasion once it has begun thus why researchers, and research group Aquaculture under HZ University of Applied Sciences is working diligently to finding a feasible solution in order to contain the problem. Prevent the oyster drills from spreading to further parts of the Netherlands, and also figuring out a way to limit the damage the level of damage they are so capable of inflicting.

There are things known, but a lot is still unknown about the Japanese Oyster drill The following research will target two main points of interest, (i) the food preference of the oyster drill, and (ii) the behaviour and feeding behaviour.

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1. INTRODUCTION

1.1. BACKGROUND

Aquaculture is a research group that is part of HZ University of Applied Sciences. Aquaculture is a method used in order to make it possible for food production in coastal marine waters and the open ocean. It is not only a method to produce food, but also restores habitats, replenishes wild stocks, along with rebuilding populations of both threatened and endangered species. The current project "Food Preference and Behaviour of the Japanese Oyster drill, *Ocinebrellus inornatus,* focuses on investigating the effects that when being provided with various prey, when a choice is given it will be interesting to discover what the true preference of the Japanese Oyster drill is. With more knowledge on this invasive species, innovative solutions can be drawn as to how the situation can be stabilized.

The Japanese Oyster Drill, *Ocinebrellus inornatus* (citation), is an invasive predatory gastropod, native to Asia, specifically Japan and Korea, but it has become a notoriously known species in oyster beds around Europe and western USA (citation). *Ocinebrellus inornatus* made its first appearance in 1995 off of the coast of Western France, and since then has spread to Northwestern, Northern France, and The Netherlands wreaking havoc wherever it is found (citation).

Though life history, basic ecology, basic feeding habits, and geographic distribution studies have been conducted, *Ocinebrellus inornatus* is still quite an unknown species. *Ocinebrellus inornatus* is gonochoristic, meaning that it has separate sexes, females and males are separate, and eggs are fertilized internally, with two reproductive periods. One from April to June, and the second from September to November, this second reproductive period gives *Ocinebrellus inornatus* a higher resistance to environmental and seasonal effects, all the more problem for oyster beds and farmers in the Netherlands.

The first appearance of *Ocinebrellus inornatus* in the Netherlands was in the year of 2007, and it is speculated that it arrived by shipments when bivalves were being imported. Since the first sighting of *Ocinebrellus inornatus* in the Netherlands, it since has been identified that it is found in two primary locations, Yereseke, and Lake Grevelingen. A common name of *Ocinebrellus inornatus* is Japanese Oyster drill, and can sometimes be seen as being referred to the common name.

1.2. PROBLEM INDICATION

Ocinebrellus inornatus is one of the worst enemies for oysters found in the Netherlands. The problem is that there is an exorbitant amount of Ocinebrellus inornatus' found in the area and they are causing a decrease in oyster populations, which is not good for both ecological and economical reasons. Oyster farming accounts for (insert fact about how much money economically) of the Netherlands total gross per capita. *Ocinebrellus inornatus* is an invasive species that has no natural predators or controls in the Netherlands, they are able to reproduce and feed more successfully, and the ratio between other species found in the Netherlands and an invasive species such as *Ocinebrellus inornatus* will grow over-time where *Ocinebrellus inornatus* will hold a greater population, having the ability to be disastrous to the surrounding ecosystem and environment. *Ocinebrellus inornatus* poses both a major economical and ecological threat to the Netherlands, and all surrounding areas to which it is not native in.

The current fear in the Netherlands is for the species decline of Oysters, and the economic loss that is being endured will continue to decline and that resources (oysters) will become scarce. The Dutch oyster cultivation has already been experiencing challenges, due to extreme weather patterns, the introduction of new predators such as *Ocinebrellus inornatus* and pathogens, overexploitation, all of which have been contributing factors to native species declines. The native European Flat oyster, *Ostrea edulis* population has already seen a significant decline since the 1970s, and now with the introduction of the invasive predator *Ocinebrellus inornatus* the fear is much higher. The Japanese Oyster drill, *Ocinebrellus inornatus* feed on molluscs, and bivalves such as oysters by drilling a hole through the oyster's shells to ultimately get to the flesh. The problem with this is that there is now an approximately 1 mm hole through the oyster's shells that leaves them vulnerable, and no longer feasible for harvest. The spread of the Japanese Oyster drill and the form in which they feed is quite detrimental.

1.3. RESEARCH GOAL

The goal of the research is to gain a greater insight into the feeding behavior of *Ocinebrellus inornatus*. There have been previous studies conducted at HZ Universty of Applied Sciences, that have drawn all inconclusive results as to what the feeding behavior and food preference of the *Ocinebrellus inornatus* is. The actual feeding preference and behavior of the Japanese Oyster drill is still quite unknown, and this study focuses on investigating the exact preferences, and behaviours that these species exhibit, when given a choice between two prey, the half-grown Japanese oyster and the small half-grown flat oyster. Previous research has indicated a very slight difference in feeding preference, in that the Japanese oyster was preyed upon more, however, the results were not enough to draw this exact conclusion. Therefore, this research aims at gaining greater results, which will lead to a definite conclusion as to what the feeding preference of the Japanese Oyster drill is.

1.4. RESEARCH QUESTIONS

This study addresses the following research questions:

1. Do Japanese Oyster drills of the same size class prefer to prey on half-grown Japanese oysters, or small half-grown flat oysters?
2. Will placing a barrier in-between the Japanese oyster drills and the Japanese oysters limit the amount of feeding that is encountered?

1.4.1. SUB-QUESTIONS

1. Do Japanese Oyster drills of the same size class prefer to prey on half-grown Japanese oysters, or small half-grown flat oysters?
    a. Which oyster species does one size class of 36-38 mm of japanese Oyster drills prefer to prey on?
    b. How many oysters from each species were drilled and preyed upon?
    c. How thick are the shells of the oysters that were preyed upon?

2. Will placing a barrier in-between the Japanese oyster drills and the Japanese oysters limit the amount of feeding that is encountered?
    a. Will the Japanese oyster drills be caught in the byssal threads of the mussel seeds, which will in turn prevent them from feeding? Or wil they feed on the mussel seeds instead of the oysters?
    b. Will there still be oysters preyed upon, if there are both mussel seeds and oysters provided to the japanese oyster drills? Will placing mussel seeds as a barrier limit how much feeding goes on?

1.4.2. HYPOTHESES (EXPECTED RESULTS)

1. Do Japanese Oyster drills of the same size class prefer to prey on half-grown Japanese oysters, or small half-grown flat oysters?
    a. Japanese Oyster drills of the same size class will prefer to prey on the half-grown Japanese oyster as it is seen in previous experiments that they had shown a slight preference for it already.
2. Will placing a barrier in-between the Japanese oyster drills and the Japanese oysters limit the amount of feeding that is encountered?

a. Placing a barrier between the Japanese oyster drills and the Japanese oysters will possibly limit some feeding, as the mussels seeds will be able to catch the Japanese oyster drills with their byssal threads.

2. THEORETICAL FRAMEWORK

2.1. *THE CHARACTERISTIC OF OCINEBRELLUS INORNATUS*

Ocinebrellus inornatus, also known, as the Japanese Oyster drill, is an invasive predatory gastropod that primarily feeds on molluscs, and bivalves that originated from Asia, countries such as, Japan and Korea, and since has made its way and was accidently introduced to Europe, and countries such as the Netherlands have been experiencing the effects of the introduction ever since 2007. *Ocinebrellus inornatus* has various names that is has been given over the years, common names are Japanese Oyster drill or Asian oyster drill, and other scientific names are, *Ceratosoma inornaum, Ocenebra japonica, Ocenebra inornata, Ocinebra inornata*, and *Tritonalia japonica,* however, for the purposes of this research and paper, the scientific name *Ocinebrellus inornatus*, will be used.

Due to the considerable amount of phenotypic variation that *Ocinebrellus inornatus* exhibits it has been difficult to classify it, but differences in morphology is what has resulted in the most recent classification to genus *Ocinebrellus* and species *inornatus.* The basic life history and ecology of the Japanese oyster drill is as follows, it is gonochorstic, it has separate sexes, eggs are fertilized internally, and they deposit their eggs on harder substrates such as oysters. There are two reproductive periods that the Japanese oyster drills undergo, one during April to June, and another in autumn from September to November, which increases their chances at producing successful offspring, due to an increased resistance to seasonal effects. The eggs are laid, and they are yellow capsules, approximately per oyster drill 20-40 egg capsules are produced, with each egg capsule containing several hundred-nurse eggs, resulting in about 10-15 embryos, because there are no natural predators in the Netherlands, the rate at which they produce is higher.

As mentioned earlier in the introduction, *Ocinebrellus inornatus* feeds by drilling a hole into the shell of its prey primarily oysters. They have chemoreceptive mechanisms in which a response to effluent (waste materials) substances of their prey which enables them to detect the healthiest prey. *Ocinebrellus inornatus* secretes sulfuric acid that enables them to soften the shell while drilling with the radula. Once they have successfully drilled through, this takes them a couple of days, depending on the size of prey, and then secrete digestive enzymes on their prey in order to consume the meat. Though their presence is an utter nuisance and deleterious for oyster cultivation, the means by which they are capable of feeding is quite remarkable.

3. METHODS

3.1. GENERAL ASSUMPTIONS

Based on previous experiments that were conducted that HZ University of Applied Sciences, regarding the Oyster Drill Project, specifically relating to the feeding preference of the Japanese Oyster drill, *Ocinebrellus inornatus*, they will exhibit perhaps a greater preference for the Japanese oyster, because it is their natural prey, but also because in previous studies it was shown that there was a slight greater preference for the Japanese Oyster than there was for the European Native flat oyster. The experiments conducted for this study will be a follow-up on that in order to get a more significant, and conclusive result. Although slight preference was shown, it is not enough evidence to draw up a solid conclusion based off of it. This study hopes to draw up a definite conclusion on what the feeding preference of the Japanese Oyster drill, *Ocinebrellus inornatus* is.

3.2.1. STORAGE OF THE JAPANESE OYSTER DRILLS

The Japanese oyster drills are caught out in the field by farmers and are brought back to facilities of HZ University of Applied Sciences, where they are stored in the Sea Lab, with proper flow through systems, coolers, and aeration. The Japanese oyster drills were starved for four days prior to each experiment. This is because, when the oyster drills are coming from out in the field, the level at which they feed is unknown, the starvation is so that they can all be onto the same level when beginning the experiment. The Japanese Oyster drills were monitored and cared after every other day, to ensure they are well kept, clean waters, and alive.

3.2.2. STORAGE OF THE OYSTERS

The half-grown Japanese and small half-grown European Flat oysters were stored in blue basins outside of the Sea Lab, again with proper flow through systems and aeration, coolers were not needed as the oysters were stored outside exposed to real temperatures. They were fed by using microalgae feed, grown in the bubble columns also in the Sea Lab. The oysters were fed approximately, 12-15 L of the microalgae every two days, in order to ensure their utmost survival and health is good.

3.3. SIZE CLASS

The size class was chosen based off of what resources were available, it is quite difficult to test a very narrowed size class unless the materials are there first, then it is easier to pick and choose to see how many are available and of which size is most desirable to test. The size class for this study was chosen because it was desirable to test, it was not tested previously and the Japanese Oyster drills range from approximately 36mm-38mm. In previous studies, larger oyster drills were used, thus now why a smaller class is being tested to see if there is a difference between the different size classes, if they prefer the same food as adult Japanese Oyster drills, whose size range from 40-47mm. Although there is no hypotheses set-up for the different size class, it is vital information that is gathered.

3.4. EXPERIMENT 1: FOOD PREFERENCE

The first experiment is set-up in the field, out in Yerseke. Five 1m x 1m enclosed iron mesh cages are used, and each of the five cages is randomized in experimental set-up by a computer generated randomization tool in excel. The cages all contain the same amount of species, 100 Japanese Oyster drills, 20 half-grown Japanese Oysters, and 20 small half-grown European Native Flat Oysters. However, the way in which they are organized within the cage and dispersed varies from cage to cage. The first cage is to the left of the dyke, and the fifth and final cage is to the very right of the dyke. The cages were split up into four quadrants, starting from the bottom left and going clockwise, bottom left is section A, top left is section B, top right is section C, and bottom right is section D. Two of the four sections were designated for either the half-grown Japanese oysters and for the small half-grown Flat oysters, and then the Japanese oyster drills were dispersed across the entire four quadrants. Table B-1 shows in which of the sections of the five cages the locations of the two kinds of oysters.

The duration of the experiment was a total two weeks with monitoring occurring every 3-4 days. Monitoring included, cleaning the cages from seaweed, crabs if any, and making sure everything was going good. No touching in the cages occurred, as that would have interfered with the experiment. Two temperature loggers were set-up in cages 1 and 5 in order to monitor what the temperature is, by having this information it can help explain feeding habits of the Japanese oyster drills. The temperature loggers were monitoring the temperature and light intensity for the whole duration of the experiment. It monitored, and recorded data at an interval of every minute. Lastly, go-pro cameras were set-up for 24 h in two cages in order to get a visual sense of oyster drill movement, behavior, and feeding preference.

3.5. EXPERIMENT 2: MUSSEL SEEDS AS A BARRIER

The second experiment was designed to use mussel seeds as a barrier between the desired prey of the Japanese oyster drills from the Japanese oysters in hopes that the mussel seeds will catch the oyster drills by use of their byssal threads. An iron fence was used to distinctly separate the mussel seeds from the Japanese oysters, in order to really see how effective it is. The fence was about 1 m long, 15 cm wide and covered and layer of mussel seeds of about 5 cm. As in the first experiment all five cages were used again, although this time the inner set up is different, and once again varies between the five different cages. In four of the five cages it was split up into three sections, A,B, and C, with the exception of one cage, cage 3 to be exact has the middle with Japanese oyster drills, a square barrier around with mussel seeds, and then outside of the border from the mussel seeds are the Japanese oysters. Although the set-up varied, each cage contains the same amount of species; there are 100 Japanese oyster drills, 40 Japanese oysters, and as mentioned previously a 5 cm layer of mussel seeds within the 1 m x 15 cm iron fence barrier. The variation between the cages was either the iron fence barrier containing the mussel seeds was facing horizontally, or vertically. The duration of this experiment was two weeks, with monitoring occurring every 3-4 days. Lastly, following the same procedure as in Experiment 1, both temperature loggers and go-pro cameras were also set-up in two cages for this experiment.

Figure 1. Experimental 2 set-up for Cage 3 (Colakovic, 2018)

Figure 2: Experimental 2 set-up for Cage 2 (Colakovic, 2018)

4. RESULTS

4.1. EXPERIMENT 1: FOOD PREFERENCE

After two weeks out of the total 40 combined half-grown Japanese oysters, and small half-grown Flat oyster samples used in Experiment 1, a total of x oysters were drilled. Of that total, x were Japanese oysters and only x were flat oysters. Examining figure A-4, it can be seen that the half-grown Japanese oysters were preyed upon more than the small half-grown Flat oysters. The images from the go-pro cameras also showed in particular, one Japanese oyster drill that was closer in distance to a small half-grown flat oyster, than a half-grown Japanese oyster, went towards the Japanese oyster instead. Also, examining figure A-5, it can be seen that not only were there more Japanese oysters drilled on, but there were more holes also. The average temperature for this experiment was around 10 degrees Celsius.

4.2. EXPERIMENT 2: MUSSEL SEEDS AS A BARRIER

Out of the total 40 Japanese oyster samples used throughout this two-week experiment x were drilled on. For this experiment it was observed that less feeding had occurred. In each cage feeding did vary slightly, however, this is expected as the arrangements were also slightly varied from cage to cage. Table B-2, shows the amount of Japanese oysters that were drilled upon in each cage. Figure A-5 shows variation between which sections have the highest peak, however, because each cage was varied, and not set up the exact same this is normal to observe. For this experiment, the highest peaks from each cage of the sections actually represented the area in which the Japanese oyster drills occupied only. Because this experiment was distinctly set up in three sections for the most part, excluding cage 3, one section had only Japanese oysters, the middle section always containing mussel seeds, and the final third section containing Japanese oyster drills, with this data it can be seen that there were more oyster drills found in their own section rather than in the Japanese oyster or mussel seeds section. The average temperature for the duration of this experiment was around 8 degrees Celsius, two degrees lower than in Experiment 1.

5. DISCUSSION

5.1. FEEDING PREFERENCE

Based off of the results, and as seen in in Figure A-3 and Table B-2, the number of Japanese oysters that were drilled was higher than the number of Flat oysters drilled. Five more Japanese oysters were fed on than the Flat oyster that is a higher value than what the previous research found. In previous research it was found that there was either the same amount of oysters fed on from each sample, from Japanese oysters and flat oysters, or there was only one more Japanese oyster that was fed on versus the flat oyster. This study conducted suggests that there is an apparent feeding preference for the Japanese oysters. Through out the five cages also more oyster drills were found in the areas of where the Japanese oyster were located, even if they were not feeding, more oyster drills occupied the same area as the Japanese oysters than they did for the Flat oysters. This is evidence for feeding preference towards Japanese oysters. The exact reasons as to why the Japanese Oyster drill prefers to feed on the Japanese oyster is unknown, some theories are that it is because it is their natural prey, however, they still feed on the flat oysters, so there must be a deeper reasoning to what draws these species to each other. Future research will be conducted on the matter of this subject regarding shell thickness of both the half-grown Japanese oyster, and the small half-grown Flat oyster that were drilled on from Experiment 1 in order to test if that takes any part in why they prefer the Japanese oyster, along with testing and analzying the metabolism and energy expenditure of the oyster drills. By conducting a test of the metabolism and how much energy the oyster drills expend on feeding on the two different kinds of oysters, a more insightful conclusion will be able tob e drawn. However, at this time, the exact details as to how this will be conducted will not be discussed for the purposes of this report, but it will be something that will be tested as a future experiment. Overall, the Japanese oyster drills prefered to prey on the half-grown Japanese oyster more than the small half-grown Flat oyster.

5.2. FEEDING BEHAVIOUR

After observing the 24h footage that was obtained from the go-pros placed from above to get an aerial view of the Japanese oyster drill movement, one particular Japanese oyster drill caugh the attention of the researcher. The reasons being, that this one oyster drill was closer in proximity to a small half-grown Flat oyster than it was to the half-grown Japanese oyster, however, the footage showed that it traveled greater, probably more inconvenient because the oyster drill must expend more energy to travel further distance. This showed true behaviour of the oyster drills in that they really tend to go towards the areas in which the Japanese oysters are found. Why they do this is still quite unknown, however, some suggestions to explain this could be due to how they feed, they sense by using chemoreceptive sensors, with the ability to sense the effluent its prey produces, it could be entirely possible that the effluent given off from the Japanese oyster, and the effluent given off of the Flat oyster are completely separate, and that the Japanese Oyster drills have capability to tell them apart based from this. This is because in the footage the oyster drill could have gone either way, and why not go towards the prey that is closer, it makes fora n obvious choice, but instead, it decided to travel further distance, so maybe the reward was greater than the energy it would have saved taveling to the closer more obvious prey choice. Definite insights have been made throughout this experiment regarding the behaviour of the Japanese Oyster drill, they are quite remarkable and have an ability to predate successfully.

5.3. MUSSEL SEEDS AS A BARRIER

From the results conducled during Experiment 1, Japanese oysters were used as samples for Experiment 2. This is because the oyster drills showed greater preference for them, and by using their prefered choice of prey, can accurately asses whether or not using mussel seeds as a barrier can be an effective method. As seen in Figure A-4 more oyster drills were stationary within their own areas and did not occupy much of the mussel seeds area, nor the japanese oyster area. Only 8 japanese oysters were preyed upon during this experiment. This is half of what was preyed upon on from the first experiment. Some possible reasoning as to why the predation was half of what it was for Experiment 1, could be that the mussel seeds being used as a barrier was successful, during monitoring (collecting of the experiment) on the final day that the experiment was run until by observation only approximately 20 oyster drills were caught by the byssal threads of the mussel seeds in about almost all of the five cages. Another reason could be that the temperature also dropped by 2 degrees celsius, this may not seem like a huge drop, but when the average temperature is 10 degrees in Experiment 1, which is already getting cool, and it drops to an even cooler temperature, it becomes almost too cold for the oyster drills to feed and predate, so what happens is they dig themselves beneth the mud. Its also quite possible that the mussel seeds barrier was successful and haltered predation by catching the oyster drills with their byssal threads, however, to only know that this is the case, more trials would need to be done. All-in all, valuable information was gained from this experiment that will certaintly be used for future research.

6. CONCLUSION

In conclusion, the experiment was deemed successful in terms of gaining a greater insight into the feeding preference and behaviour of the oyster drill. As seen from the results section

7. RECOMMENDATIONS

7.1. CONTINUATION OF THE RESEARCH

Based from the results from Experiment 1 and 2 it is to be recommended that future experiments be run for a total duration of three weeks instead of two. The reasoning behind this is because, though there was enough evidence drawn in order to see feeding preference, none of the oysters that were fed on were drilled completely through to get to the meat, there were holes of depths of about 1 mm, however, none that were through. Extending it an extra week would also allow for collection of more data.

As for following up with Experiment 2, when conducting it again it is a good idea to actually count excatly how many oyster drills are caught in the byssal threads, this will allow for a more definitive conclusion to be drawn up on whether or not there was reduced feeding because the barrier was a success or if it was because of the lowered temperature.

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APPENDICES

APPENDIX A. FIGURES

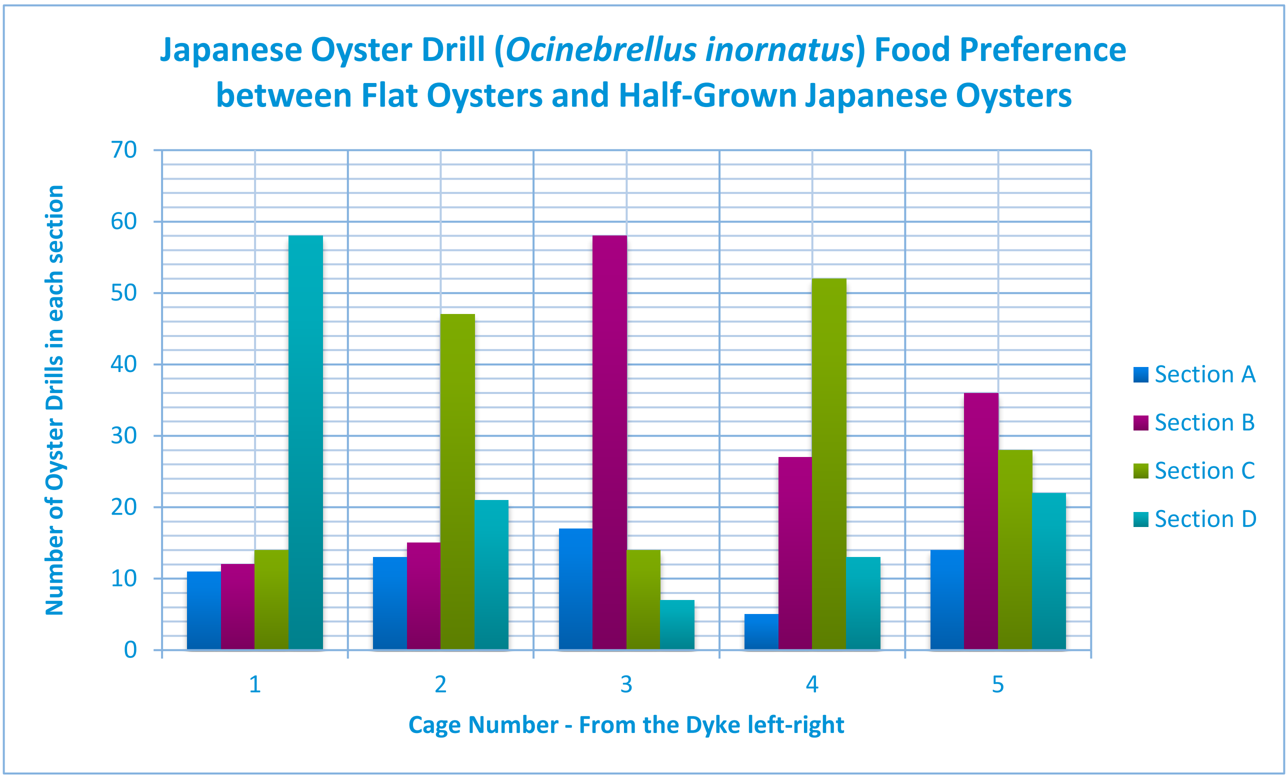

Figure A-1: Japanese Oyster Drill, *Ocinebrellus inornatus* Food Preference between small half-grown Flat Oysters and Half-Grown Japanese Oysters – Experiment 1.

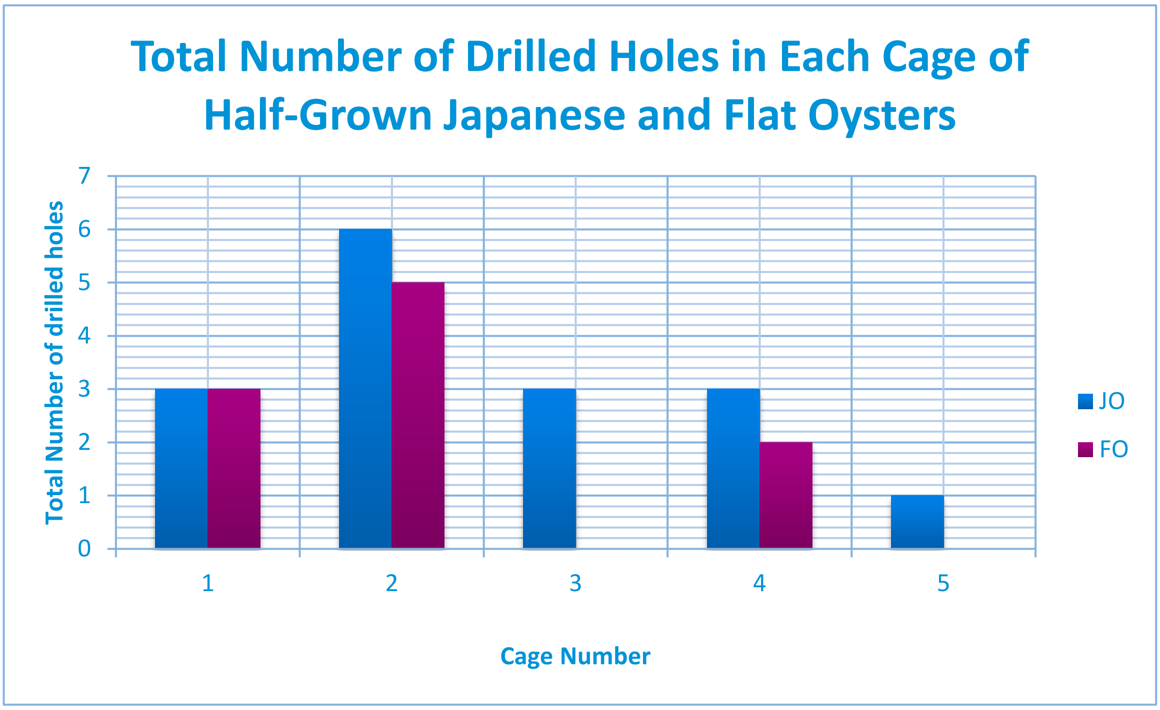

Figure A-2: The total number of Oysters that were drilled within each of the five cages – Experiment 1.

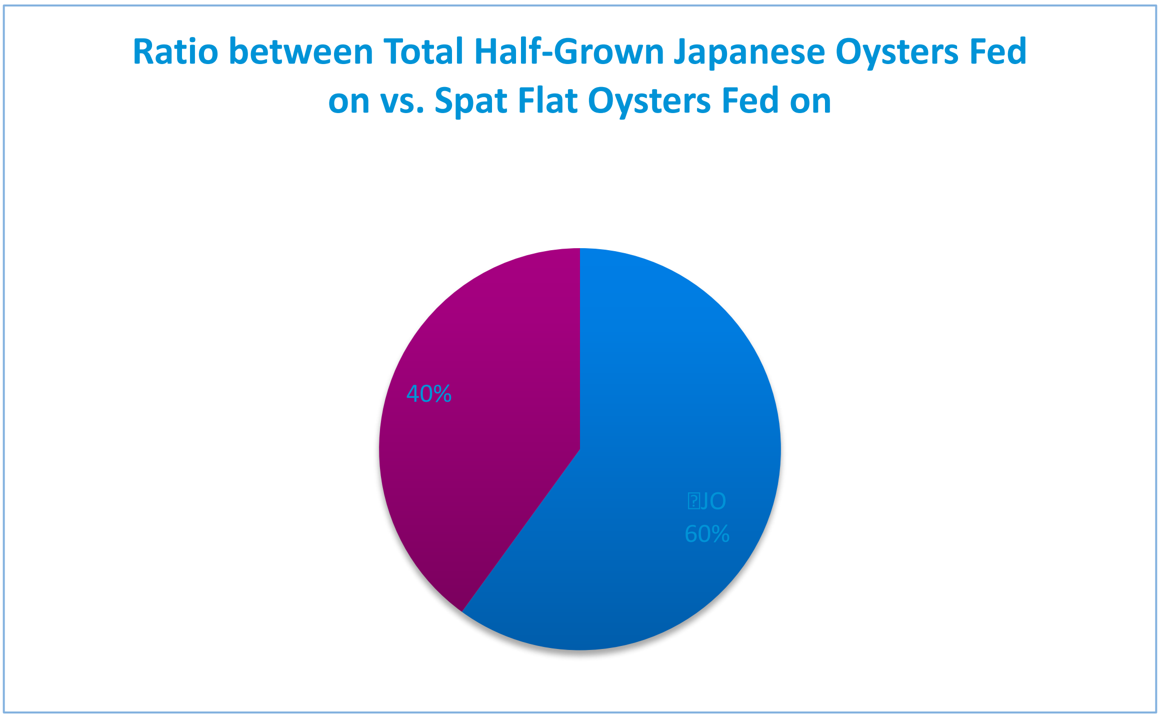

Figure A-3: The Ratio of Predation between the Half-grown Japanese oysters and the small half-grown Flat oysters- Experiment 1.

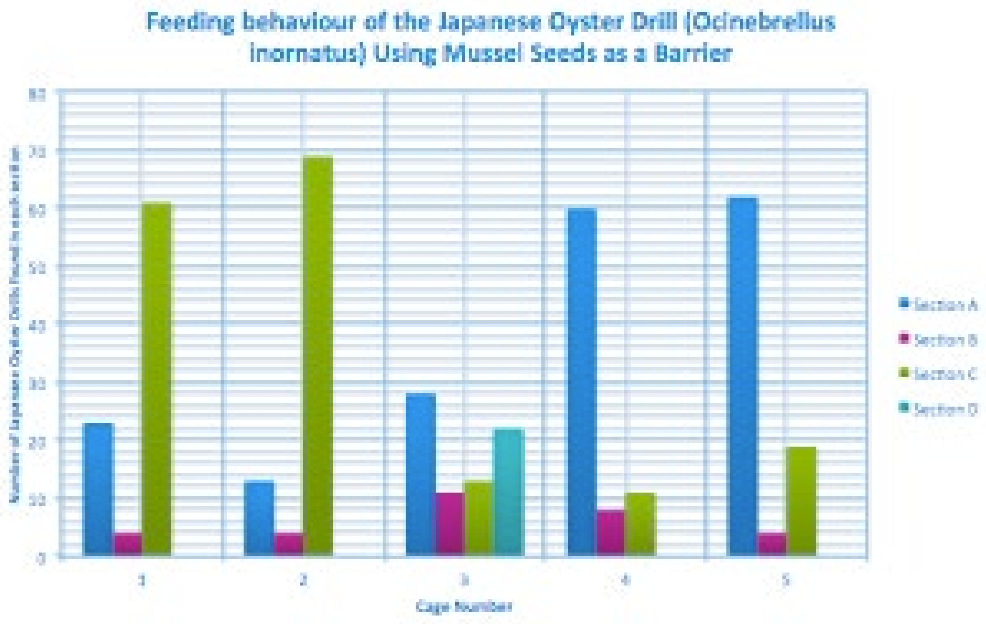

Figure A-4: Using Mussel Seeds as a Barrier between oysters and Japanese Oyster

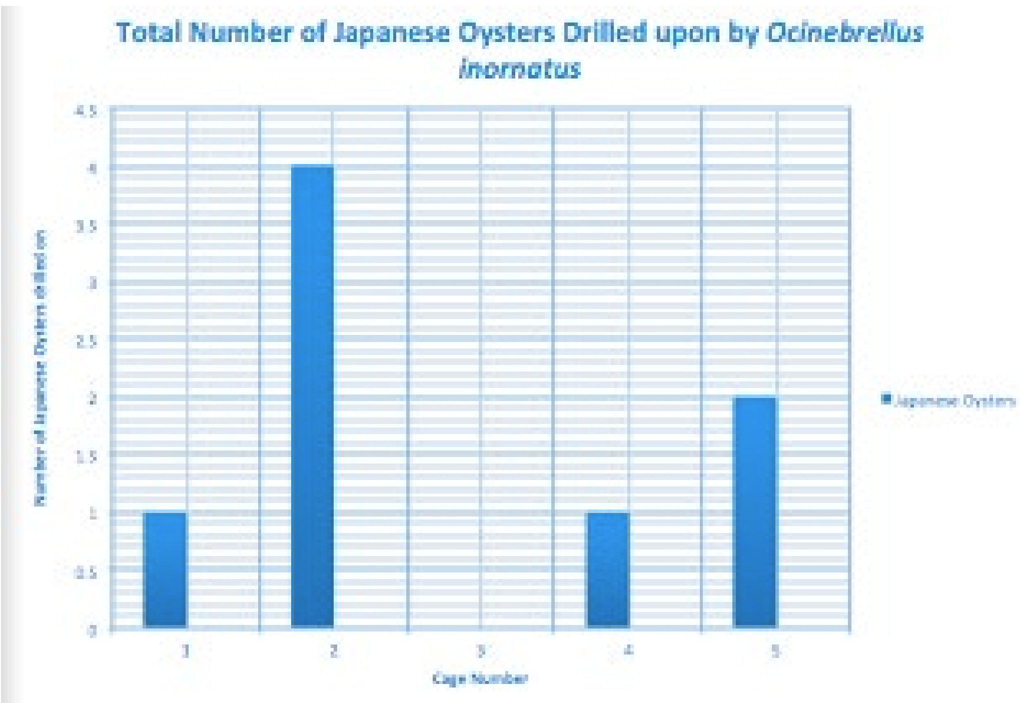

Figure A-5: The total number of Japanese oyster that were preyed upon by the Japanese oyster drills with the mussel seeds being used as a barrier in place.

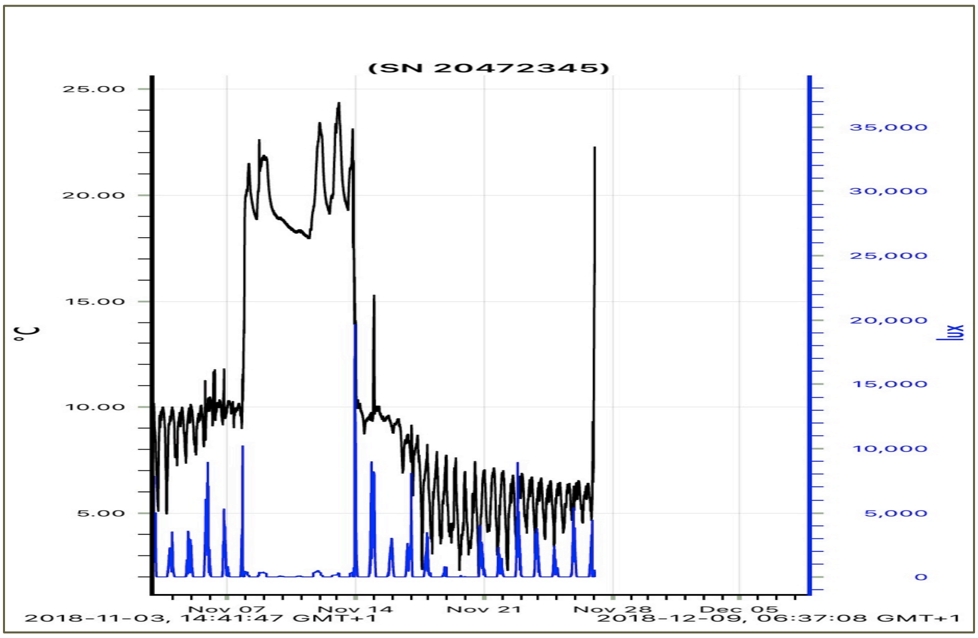

Figure A-6: Temperature logged for both Experiments 1 and 2.

APPENDIX B. TABLES

Cage Number	Section A	Section B	Section C	Section D
1	Small half-grown Flat oysters	X	X	Half-grown Japanese Oysters
2	X	X	Half-grown Japanese Oysters	Small half-grown Flat oysters
3	Small half-grown Flat oysters	Half-grown Japanese Oysters	X	X
4	X	Small half-grown Flat oysters	Half-grown Japanese Oysters	X
5	X	Half-grown Japanese Oysters	X	Small half-grown Flat oysters

Table B-1: Representation of the Experimental 1 set-up for in which sections the samples were placed in .

Cage Number	Section A	Section B	Section C	Section D
1	Small half-grown Flat oysters	X	X	Half-grown Japanese Oysters
2	X	X	Half-grown Japanese Oysters	Small half-grown Flat oysters
3	Small half-grown Flat oysters	Half-grown Japanese Oysters	X	X
4	X	Small half-grown Flat oysters	Half-grown Japanese Oysters	X
5	1 small half-grown Flat oyster	Half-grown Japanese Oysters	2 small half-grown flat oysters	1 Small half-grown Flat oysters + 1 half-grown Japanese oyster

Table B-2: The Table shows in which of the sections the samples can be found after a two week experimental duration for Experiment 1.