SLIDE 1

1. Hello everyone, I'm Olivier Collard, a graduate student in Oceanography from the University of Liège in Belgium. Currently, I'm doing an internship at STRI before starting my thesis.
2. My project focuses on studying the Impacts of Past Environmental Changes on Temperature Stress Responses

SLIDE 2

1. Before I discuss my project, let me provide a quick introduction to corals for those who are unfamiliar.
2. Corals are symbiotic cnidarians that are in a close relationship with photosynthetic dinoflagellates called Symbiodiniaceae.
3. This association bring advantages to both parts. The corals provide nutrients, protection, and a stable position for the algae, while the algae provide over 90
4. Symbiodiniaceae is divided into nine different groups called clades and that are labbeled from A-I, but corals only associate with six of them.
5. Corals are typically dominated by one clade, although other clades may be present in lower concentrations.

SLIDE 3

1. Since the last decades, corals are facing an increasing pressure of environmental stress due to antropic activities leading to what is known as « coral bleaching ».
2. Coral bleaching is the expulsion of the symbiodiniaceae by the host due to different environmental stress such as a change in salinity, light intensity or temperature

SLIDE 4

1. Coral respond to those stress using different strategy
2. Such as change in mcrobiome community. For instance, in a temperature stress scenario, some corals can switch its symbiodiniaceae community for more thermal tolerant symbiodiniacea such as clade D
3. Chnage in feeding strategy from autotroph to an heterotroph strategy and vise versa.
4. Change in morphology, where a coral can shift from a branching morphology to a plate like morphology when light is reduce.
5. Or a change in it's gene expression by epigenetic mechanism such as dna methylation, histone modification or non coding RNA.

6. Corals as much as plant are sessil organism and those tipe of organism is believed to have a great epigenomic plasticity as they can't move away from unfavorable environnement but has to adapt.

SLIDE 5

1. it is known that corals that are exposed to a stress tend to be more resistant to subsequent stress and those acclimatation process are believed to be partially linked to epigenetic modification.

2. The dynamic of epigenetic mechanism in corals is strongly understudied despite their potential significant implication in their response to climate change and will be the main point of focus of this project

SLIDE 6

1. The main project problematic is as follow, « do previous environmental variations impact the resilience of corals to future temperature change? »

2. The project will be divided into 2 main goals,

3. study the impact of long term and short term environmental change on coral's DNA methylation, transcriptome, microbiome and morphology.

4. measure the impact of previous environmental varaitions on the resilience to futur short-term temperature stress.

SLIDE 7

1. The Eastern tropical pacific is an Oceanographic zone that is home of one of the most isolated and resilient coral reef in the world and is defined by extreme temperature, salinity and nutrient change.

SLIDE 8

1. The pacific coast of Panama is divided in 2 golf, the golf of Panama and the Golf of chiriqui.

2. Both golf posees a set of island, las perlas for the golf of Panama and Coiba in the golf of chiruiqui.

3. Both island poseess vast reef mainly dominated by corals of the genera pocillopora and in particular 2 species pocillopora meandrina and verrucosa.

SLIDE 9

1. From january to may, when the intertropical convergence zone migrate south, the pacific coast become exposed to strong winf coming from the north.
2. this strong wind induce an Ekman pumping forming a strong upwelling in las perlas that lead to a rapid change of environment within days. .
3. Coiba in the other hand is protected by this event due to a chain of maintain called the central Cordillera

SLIDE 10

1. For this project, I will use this seasonal event to study the impact of environmental change on corals.
2. the project will be carried out with the assistance of the smithsonian tropical research institute in Panama and their facilities in Panama city, Coiba and Las Perlas. .
3. 24 colonies have already been tagged by one of my collegue: 6 of each species in each sites.
4. And the project will be divided in 3 main Workpackage

SLIDE 11

1. The first workpackage will consist of studying the impact of long-term environmental change on corals (over multiple years)
2. corals in las perlas has been influenced by the seasonal upwelling for more than hundred years. .
3. In this case Coiba will serve as a negative control as it is not influenced by the upwelling.
4. for this the tagged colonies will be collected in las perlas and in Coiba during the upwelling season and the non upwelling season.

SLIDE 12

1. The first workpackage will consist of studying the impact of long-term environmental change on corals (over multiple years)
2. In this case Coiba will serve as a negative control as it is not influenced by the upwelling.
3. for this the tagged colonies will be collected in las perlas and in Coiba during the upwelling season and the non upwelling season.
4. The methylation, the transcriptome and the microbiome will then be measured

SLIDE 13

1. The second workpackage will consist of studying the impact of short-term environmental change (over one year)
2. It will consist of a crosstransplantation between the 2 island. for this 6 fragments of the tagged colonies will be at crosstransplanted between the 2 zone.
3. 6 fragments of each colonies will also be transplanted into their original location to serve as a negative control.
4. The transplanted corals will then be left for one year so they will experience one upwelling season.

SLIDE 14

1. the different colonies, will then be sampled during the upwelling (in march) and after the upwelling in July 2024 (change from the application)
2. and the morphology will be measure using an artec space scanner before and after a year of transplantation.

SLIDE 15

1. for the last workpackage. The transplanted corals will be brought back to the Smithsonian to perform a short temperature stress.
2. tranplanted corals will be put under a short termal stress to mesure their resilience to temperture change after short and long exposure to environmental change.

SLIDE 15

1. For the temperature stress, I will use the mesocosm that possess STRI.
2. The mesocosom consist of 3 tub in which can be placed 8 aquariums. .
3. Each aquarium will contain 3 replicates of the 6 colonies of one species. 2 aquarims will be set per condition, 1 for pocillopora verrucosa and one for pocillopora meandrina. And we have 4 condition per thub contransplantation, cross-transplantation for coiba and las perlas.
4. Each thub will go under a different stress, one wihile endur a cold stress, an other a heat stress and another will consist of a control.

SLIDE 16

1. For the cold stress, the temperature will start at 28°C and be reduce by 1 degree each day for 4 days to reach 24°C and be held for 3 days
2. For the heat stress, the temperature will start at 28°C an be rise by 1 degree each day for 4 days to reach 32 °C and be held for 3 days.
3. The microbiome, the transcriptome and the methylation will be measure before and after the stress.

SLIDE 17

1. The morphology of the coral will be measured through 3D scan using the Artec Space Spider scan already own by the university of Bruxelles .
2. The DNA methylation and the transcriptome and microbiome will be measured using oxford nanopore technology devices own by the University of Bruxelles
3. The microbiome will be measured by amplifying the ITS2 and 16S marker and sequenced with the Mk1C.
4. The DNA methylation and Tanscriptome will be measured using thr Promethion 2