



# Orpheus Island Research Station

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## Morris Family Trust Student Research 2019 Grant Successful Applicant: Mila Grinblat

My name is Mila Grinblat, in 2016 I graduated from Tel-Aviv University, Israel with a M.sc in marine ecology, under the supervision of Prof Yossi Loya, focused on the effects of climate change on coral physiology and reproduction in the northern Gulf of Eilat, Red Sea. In 2017 I moved to Australia and currently I am a PhD candidate at James Cook University under the supervision of Prof David Miller. My research is focused on reproduction, sex determination and gene expression in scleractinian corals with finding the up-stream pathway for sex determination being the main goal.



Photo by: Dan Vaughan

Reproductive studies are an important prerequisite for understanding life-history strategies, population ecology and for evaluating population continuity. Understanding the conditions for successful reproduction and recruitment is essential to management and preservation of the reef, especially in an era of constantly growing threats to coral reefs. Though we have come a long way in coral reproduction research, much remains to be discovered about sex allocation, determination and differentiation processes. As the majority of scleractinian corals reproduce as hermaphrodites, isolating the functions of the different sexes is often impossible. Thus far, our knowledge about the sex-determination mechanism in corals is restricted to the presence of the *Dmrt* (Double sex/Male-abnormal-3 Related Transcription factor) genes (i.e. DM domain), conserved through evolution of animals and the absence of sex chromosomes controlling the sex-determination process in many organisms.

Previous studies have suggested that sexual reproduction is under both genetic and environmental regulation in Cnidaria. However, despite the mechanisms of the DM domain being considered as highly conserved in controlling sex differentiation and development, the upstream mechanism is currently unknown. Additionally, although the *Dmrt* genes are highly studied in terms of their role in sexual differentiation, they are not exclusively involved in gonad development and sex-related functions. The gonochorism (separate sexes) of *Fungia fungites* corals and their capability of sex change allow us to separate the sexes and study the upstream mechanism leading to sex determination.

This grant was used to attend the annual coral spawning event (November-December). I have over 80 individual corals tagged and located at the reef near the station which I have been sampling monthly and monitored their spawning in November and December spawning events of 2018 and November 2019. Up until now I have completed 15 field trips to OIRS and worked towards understanding the sex determination genetic mechanism.

During the 2019 spawning event, the corals were isolated in individual tanks in during November spawning, sampled and their sex was recorded. This was followed up by isolation of the females for additional 4 weeks creating a sperm limited environment. In December, 2 individuals still released swimming larvae, suggesting a possibility of asexual offspring development. Those samples were collected and will be analysed to assess the gene differences between the parent and offspring. While sexual reproduction is sometimes considered the best way of evolutionary adaptation to change, asexual reproduction can be equally important. The influence of environmental pressures in natural selection results in individuals possessing a combination of successful genes that are adapted to the local conditions. Reproducing asexually would reduce the dilution of the successful genes and will help maintaining the coral fitness.

Our integrated genetical and ecological approach is expected to provide a major step forward towards understanding the mechanism that is shaping coral sexual reproduction, and through this understanding how genetics and environmentally-induced flexibility, structure scleractinian populations. Furthermore, we expect our work to stimulate research on the effect of global warming on the flexibility in reproduction as a means of adaptation