Reproductive ecology of *Lophelia pertusa* in Mingulay Reef and the Logachev mounds (North East Atlantic): a multi-scale comparison

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Introduction

Cold water corals form three-dimensional structures hosting a high diversity, and offering refuge and a nursery to many associated species. However, many aspects of its biology are still not well known, including reproduction.

This study investigate the reproductive status of the cold water coral *Lophelia pertusa* in two areas of the North East Atlantic: the Mingulay Reef complex and the Logachev mounds (Fig.1). The collection of samples was possible just during a single sampling period (May-June), hence the study has been conducted with samples from these year period, comparing the stage of the reproductive cycle of *L. perstusa* at intra-colonial and inter-colonial level, as well as comparing colonies from the two geographic areas (inter-regional comparisons).

The study analyses the gametogenesis as well as the potential fecundity (number of oocytes) at the three comparative levels (intra-colonial, inter-colonial, interregional).

Aim

Describe and quantify the state of the reproductive cycle of *Lophelia pertusa* in Mingulay Reef (MR) and Logachev Mounds (LM), in May-June, exploring the potential differences at intra-colonial, inter-colonial and inter-regional level.

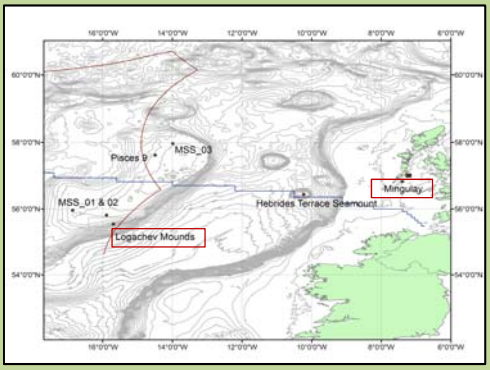


Fig.1: Map of the research area. Sampling zones of Mingulay Reef and Logachev mounds are displayed in the red frames

Materials and methods

Sampling was conducted during the expedition "Changing Oceans" (May-June 2012), on board the RRS *James Cook*. Additionally samples collected on board the RRS *Discovery*, collected in the same year period but in 2011, have also been included in this analyses.

Lophelia pertusa samples were collected, from 100 to 872 m depth, by means of the Remotely Operated Vehicle (ROV) Holland I.

Samples were processed for histological analyses. Series of 15 slides for each polyp have been processed. Sex of each colony was determined. For all female colonies, oocyte were counted and measured by means of a light microscope using the software Olympus program Cell D.

Statistical analyses have been performed by means of the software SPSS and the "R" language (library "circular"). Circular statistics have been applied, allowing to graphically present the degree of oocyte development in each mesentery of each polyp. For the inter-regional comparison, average values have been used.

Results

Site comparison (MR *vs* LM)

Sex ratio was 2,4(M):1(F) ■ Differences in oocyte sizes between MR and LM were statistically significant (Kruskal-Wallis test, p< 0,05). In Logachev 60% of the oocytes presented sizes ranging from 20 to 30µm, whereas in Mingulay 30% of the oocytes presente sizes ranging from 30 to 40µm (Fig. 4) ■ Statistical significant differences (Kruskal-Wallis test, p< 0,05) were detected in the oocyte number /polyp between geographical zones (Fig. 5)

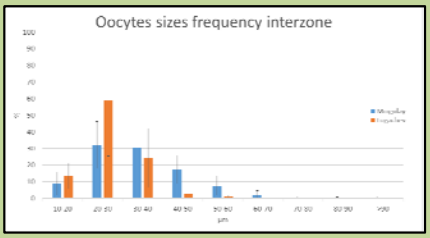


Fig. 4: Oocytessize frequency in Mingulay Reef and Logachev Mounds

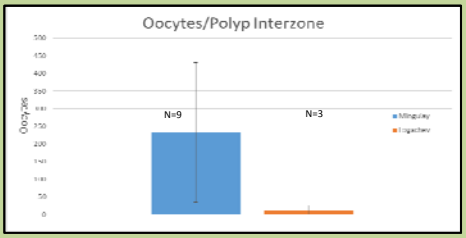


Fig. 5: Number of oocytes per polyp in Mingulay Reef and Logachev Mounds

Inter-colonial comparison

Statistical differences (Kruskal-Wallis test, p< 0,05) were detected for oocyte size between the 9 female analyzed colonies in MR. Post-hoc analysis revealed significant differences between 5 colonies (Fig. 6) ■ Differences in oocyte number per polyp were also detected (ANOVA test, p<0,05), post-hoc analysis shown significant differences in colonies 2 and 5 (Fig.7 & 8)

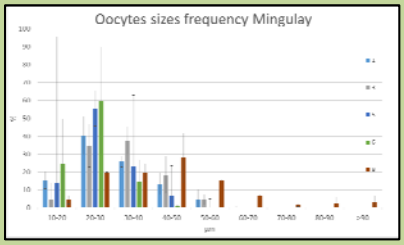


Fig. 6: Oocytes sizes frequency in the five colonies from MR that shown significant differences

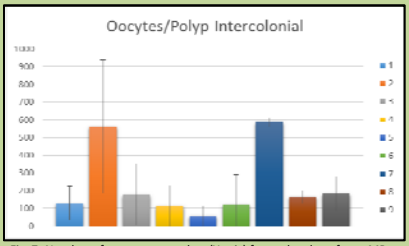


Fig. 7: Number of oocytes per polyp (Y axis) for each colony from MR (colonies are indicated with numbers from 1 to 9)

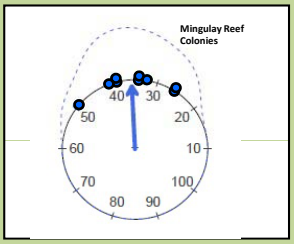
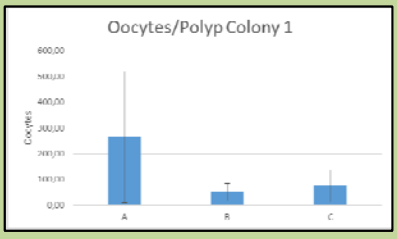


Fig.8: Circular graphic representing the mean oocyte size (in microns) in each colony from MR. Blue dots indicate mean size of oocytes from each colony

Intra-colonial comparison

No significant differences were found in the number of oocytes per polyp nor in the oocytes sizes between polyps of each colony studied (Figs. 9 & 10) ■ Circular statics revealed statistical significant differences in oocyte size, at mesentery level in 46% of the analysed polyps



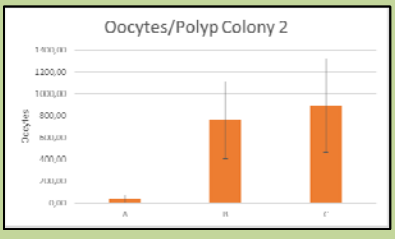


Fig. 9: Number of oocytes per polyp in the three branches (A. B and C) analysed per colony (three polyps analysed per each branch). Results for colonies 1 and 2 from MR are displayed

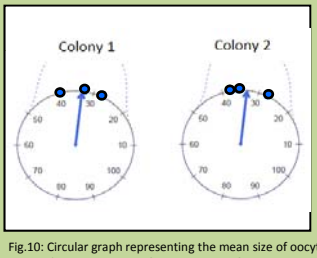


Fig.10: Circular graph representing the mean size of oocytes (in microns) in each branch of colony 1 and 2 from Mingulay Reef. Blue dots indicate oocyte mean size from each colony branch

Conclusions

Site comparison

Gametogenesis started earlier in MR than in LM (Fig. 4) ■ Female colonies present higher number of oocytes per polyp in MR than in the LM (Fig. 5)

Inter-colonial comparison

Differences detected in the oocyte sizes in the colonies from MR may indicate a continuous reproductive processes (Fig. 6)

Intra-colonial comparison

Differences in maturation at mesentery level, revealed a gradual development of the gametogenic cycle in the mesenteries. This potentially continuous gametogenic cycle may be advantageous for the species increasing the reproductive period of *Lophelia pertusa*.

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