Water volume, dissolved oxygen concentration and light irradiance influence the resistance of Seriatopora hystrix to transportation in small volu me

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Water volume, dissolved oxygen concentration and light irradiance influence the resistance of Seriatopora hystrix to transportation in small volume

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Introduction

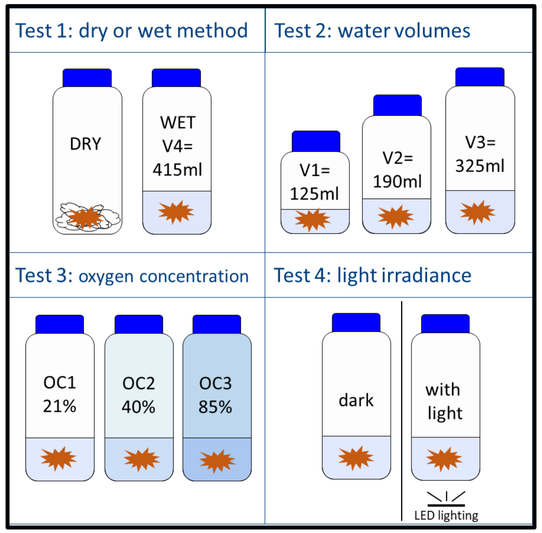
Coral aquaculture has been developed worldwide, for live coral trade. Considering the large distance between the importers and exporters, shipping is one of the main constraints. Transporting live coral nubbins is one of the major constraints. Corals must be transported during <20h using concentrated oxygen to avoid high post-transportation mortality. The objectives of the present research include the search for an improved shipping technique to increase the resistance of small size coral nubbins to the transporting conditions and duration, and decrease the post-transportation mortality.

Materials and methods

To understand the effect of the transportation water quality to the growth and mortality of the nubbins after transportation, we performed series of transportation simulations on *Seriatopora hystrix*.

We tested :

- different volumes of water,
- different oxygen concentrations in the gas phase
- and added 24 LED Handy Lamp to provide light irradiance of >100 µmol $m^{-2}s^{-1}$ in the transportation box.



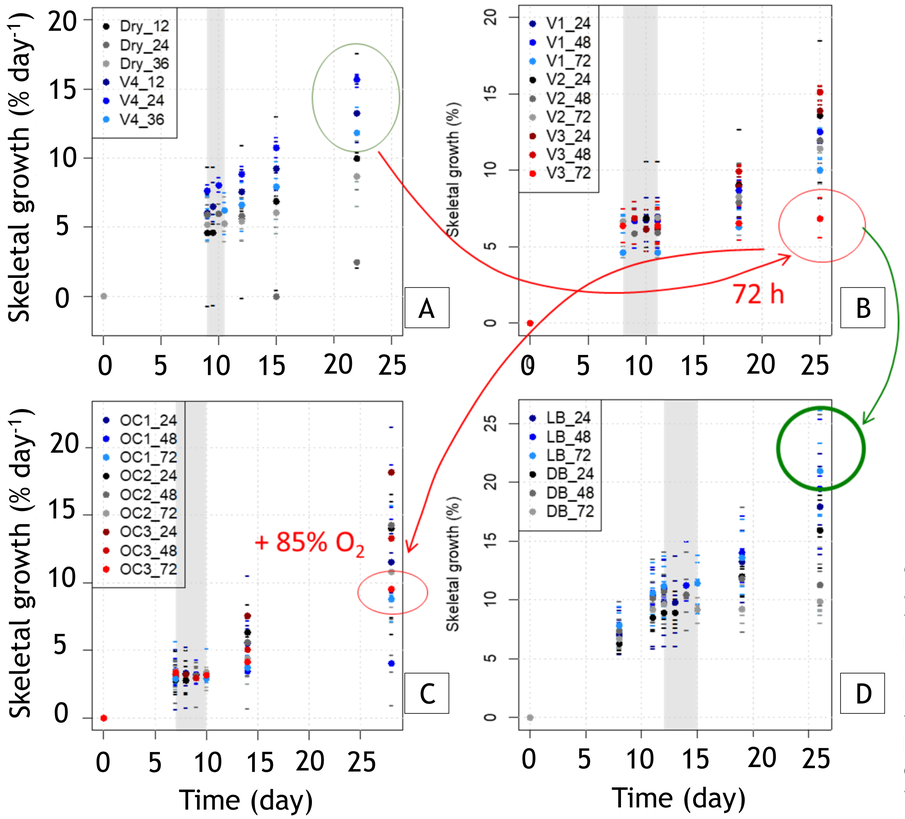
Monitored physico-chemical parameters of the water:

Salinity; pH (total scale), Total alkalinity, Concentration of nitrite ([NO2-]), nitrate ions ([NO3+]), ammonium ions ([NH4+]), orthophosphates ([PO43-]).

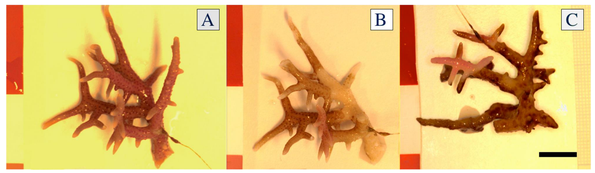
Coral growth: buoyant weight, converted into skeletal weight. Details in Leblud et al., 2014 and Todinanahary et al. 2016

Results

During transportation, nubbins extracted calcium carbonates for growth, reducing the alkalinity of the water and therefore the pH up to 6.67. Dissolved oxygen was also rapidly reduced to 0.19 mg L^{-1}. The concentration of inorganic nitrogen, particularly the ammonium ions increased after 24h and abruptly reached very high concentration after 48h. Below 48h, the higher the water volume was, the better the nubbin grows after transportation, and the higher the oxygen concentration was, the better the nubbin grows after transportation. Beyond 48h, in all cases, the water quality became abruptly critical for the nubbins and can partly induce mortality.



< Skeletal growth rate (% day^{-1}) of the nubbins before, during (grey band) and after transportation. Points represent the mean and each dash represent one individual nubbin). Each subfigure corresponds to the test performed (A. dry and wet method; B. water volumes; C. oxygen concentration; D. light irradiance).



Colour and visual aspect of a nubbin before (A), at unpacking (B) and 2 weeks after transportation (C). A represents a healthy nubbin; B represents a bleaching/partly died nubbin; C is a died nubbin. Scale bar = 1 cm

Conclusion. Adding light in the transportation box permitted to keep the water quality acceptable for corals until 72h with the use of normal air.

References. Todinanahary GGB (2016) Evaluation du potentiel biologique, économique et social de la corallicutlure villageoise dans le sud-ouest de Madagascar. PhD thesis, University of Mons, Belgium. 256pp

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