Developing coral factories producing resilient and customized corals

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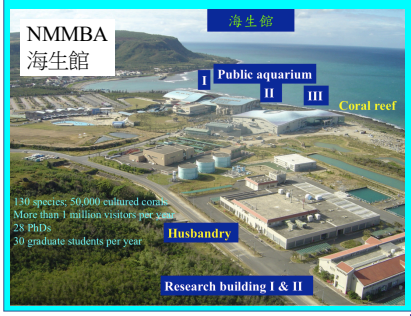
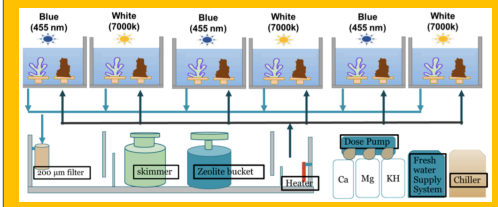


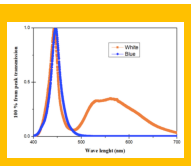
Coral ark and large-scale **coral farm** have been established in NMMBA for 20 years.

Coral factories are developing.

Internet of Things and 3D printing will be applied in the near future.

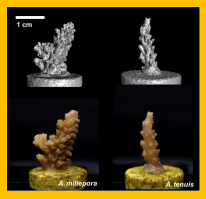
1. A factory for ornamental stony coral Acropora.

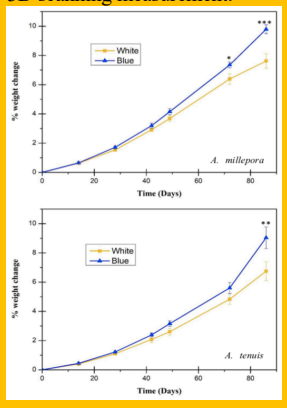


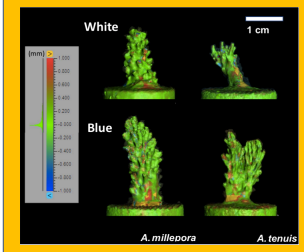


Blue light (455 nm)
White light (7000K)
PAR: 200±10 μmol quanta m^{-2} s^{-1}
Reef coral, *Acropora millepora*, *Acropoa tenuis*
Feed enriched *Artemia salina* in a separate tank

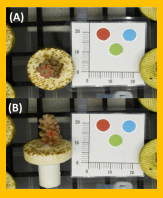
Blue light enhance coral growth.
3D scanning measurement.

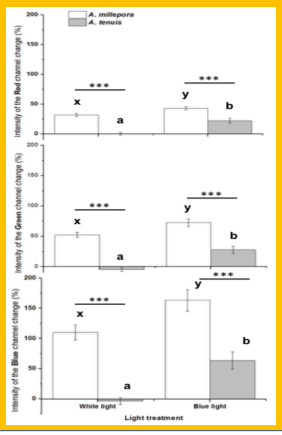


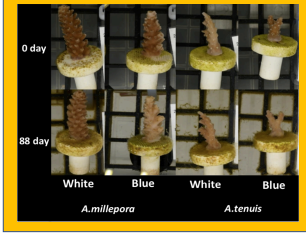




Blue light enhance coral growth.
RGB measurement.





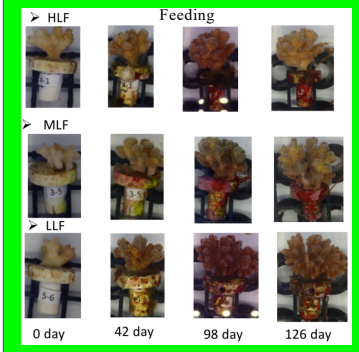


Recirculating aquaculture systems (RAS)

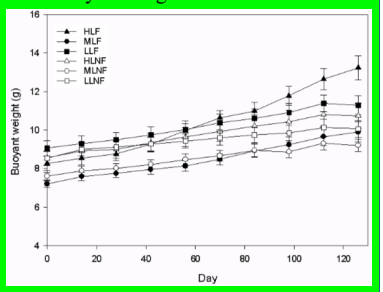
Versatile, standardized modular system
Automatic control
Synthetic seawater
Live rock, live sand
Feeding and culturing separation
Non-destructive measurements

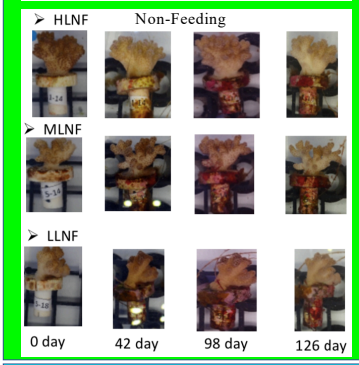
2. A factory for broodstock breeding of stony corals Pocillopora.

Photosynthetically active radiation:
High light: 250 μmol photons $m^{-2}s^{-1}$
Median light: 150 μmol photons $m^{-2}s^{-1}$
Low light: 100 μmol photons $m^{-2}s^{-1}$
Feed enriched *Artemia salina* in a separate tank
Reef coral, *Pocillopora damicornis*

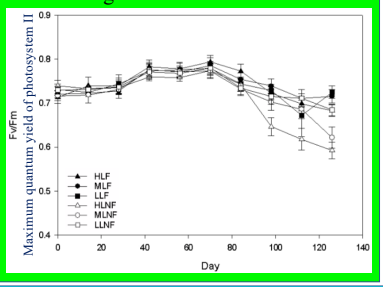


Feeding enhances coral growth.
Buoyant weight measurement.





Feeding enhances photosynthesis.
Diving PAM.

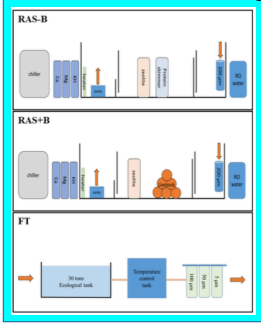


3. A factory for pharmaceutical soft coral Sarcophyton

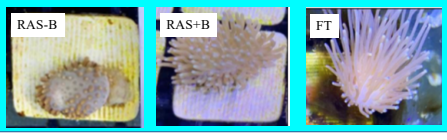
RAS-B: a RAS without exogenous biological input
RAS+B: a RAS with live rocks and an exogenous food supply, fed with phytoplankton solution
FT: a flow-through system featuring natural seawater.

Light: 100 vs 200 μmol quanta m^{-2} s^{-1}
Flow: 5 vs 15 cm s^{-1}
Soft coral, *Sarcophyton glaucum*

Culture systems influence effects of light and flow on corals



Parameter	RAS-B	RAS+B	FT
Specific growth rate	Light & Flow		Light & Flow
Oral disc diameter	Light		Flow
Organic weight			Flow
Oral disc diameter x Buoyant Weight		Correlation	
Oral disc diameter x Organic weight		Correlation	Correlation
Buoyant Weight x Organic weight		Correlation	



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