Title: Transcriptomic study on coral responding to the marine acidification and rising seawater temperature

Seonock Woo
Korea Institute of Ocean Science & Technology, Busan 49111, Republic of Korea

Keywords: coral, acidification, environmental stress, gene, transcriptome

I. Abstract

Rising at atmospheric CO_2 concentrations are placing spatially divergent stresses on the world's tropical coral reefs through increasing ocean surface temperatures and ocean acidification. The carbon dioxide among the atmosphere is dissolved in the sea water, increase the concentration of the hydrogen ion. The biological and physiological processes of many organisms will be challenged by increasingly acidic conditions and temperatures. In this research, we studied the physiological aspect, and transcriptional responses of the soft coral (*Scleronephthya gracillimum*) in Korea against combination of heat and carbon dioxide (CO_2) with or without. We collected corals from Jeju , Korea. For the microarray experiment we exposed corals to a various pH stress (pH 7.0, pH 7.5), heat stress (28 ^{0}C) and pH, heat stress (28 ^{0}C + pH 7.0, 28 ^{0}C + pH 7.5). As the results, we found the shared genes in corals responding to various stresses. Eight common genes expressions were induced and 9 common genes were reduced over 2 fold by 28 ^{0}C, pH 7.0, pH 7.5, 28 ^{0}C + pH 7.0 and 28 ^{0}C + pH 7.5. These genes had the significant change of the expression more in temperature + pH stress. These isolated gene candidates were differentially expressed and the results suggested they could be used as molecular biomarkers for the identification of environmental stressors.

II. Methods

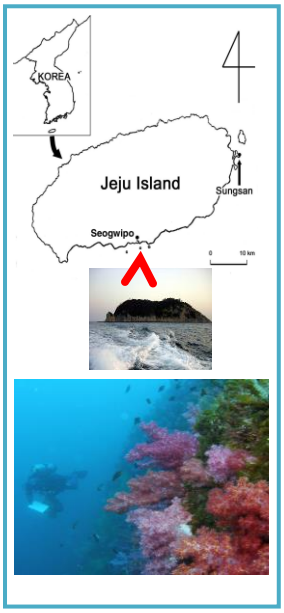




Fig. 1Coral sampling site (left)
Fig. 2 *Screlonephthya. Gracillimum (right)*

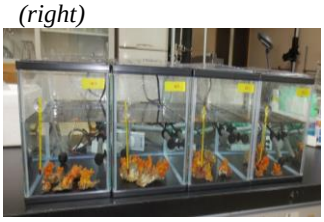
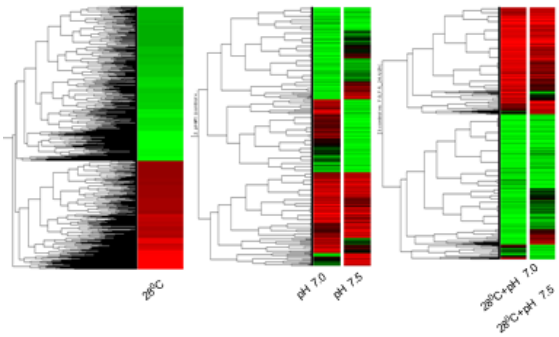


Fig. 3 Heat and acidification stress exposure

This study was supported by NRF-2017R1A2B2012541.

III. Results



Approximately 200 genes including Kinesin-like protein, guanine-nucleotide releasing factor, caspase, apoptotic cysteine protease, etc changed their gene expression levels after heat shock stress. These isolated genes were clustered into functional groups like information storage and processing, cellular processes and signalling and metabolism. Over 70 % of isolated genes were related to the signal transduction.

Table 1. The change of the common gene about the stress. (fold change ≥ 2)

	Gene	KOG	28℃	pH 7.5	pH7.0	28℃ + pH 7.5	28℃ + pH 7.0
1	Mitochondrial processing peptidase, alpha subunit	O	+20.5	+29.5	+27.0	+70.8	+65.5
2	CWC15 homolog putative mRNA	S	+7.5	+7.1	+11.8	+31.2	+53.5
3	Mitogen-activated protein-binding protein-interacting protein	T	+4.3	+5.5	+8.8	+13.9	+21.0
4	snRNA-associated Sm-like protein	A	+2.3	+3.0	+3.7	+9.8	+50.4
5	Transcription factor zerknullt and related HOX domain proteins	R	+2.9	+5.9	+11.0	+9.0	+40.4
6	sll1483 precursor putative mRNA	R	+2.2	+4.9	+3.8	+7.9	+10.2
7	Sodium-neurotransmitter symporter	T	+2.3	+2.9	+2.5	+3.7	+6.8
8	Carnitine O-acyltransferase CPT2/YAT1	I	+2.6	+3.5	+3.8	+3.3	+2.9

Table 2. The change of the common gene about the stress. (fold change ≤ 2)

	Gene	KOG	28℃	pH 7.5	pH7.0	28℃ + pH 7.5	28℃ + pH 7.0
1	von Willebrand factor and related coagulation proteins	WV	-2.5	-5.3	-4.9	-13.8	-43.1
2	snRNA-associated Sm-like protein	A	-3.8	-9.6	-3.9	-100.0	-100.0
3	Serine proteinase inhibitor (KU family) with thrombospondin repeats	O	-5.0	-2.8	-2.8	-6.1	-10.8
4	C-C motif chemokine 28 precursor putative mRNA	Q	-5.8	-5.4	-6.2	-2.0	-5.9
5	U6 snRNA-associated Sm-like protein LSm5 putative mRNA	A	-2.3	-2.8	-2.9	-4.1	-4.6
6	Transcription elongation factor 1 homolog putative mRNA	K	-3.6	-7.5	-2.9	-23.7	-41.5
7	Mizuhopecten yessoensis SP-S mRNA for scallop shell matrix protein	A	-4.4	-15.0	-3.7	-16.9	-18.9
8	sll1483 precursor putative mRNA	R	-2.5	-4.6	-3.3	-2.4	-13.8
9	Anguilla japonica relaxin 3c precursor (Rln3c) mRNA	S	-5.6	-3.5	-9.8	-4.3	-3.5

IV. Biography

Seonock Woo has completed his PhD from Yonsei University and postdoctoral studies from UC Berkeley, USA. She is a Professor and principal research scientist in KIOST, South Korea. She has published more than 60 papers in reputed journals and has been working as a member of coral working group in PICES.

V. Presenting author details



Seonock Woo
+82-10-6631-3017
Coral Reefs session