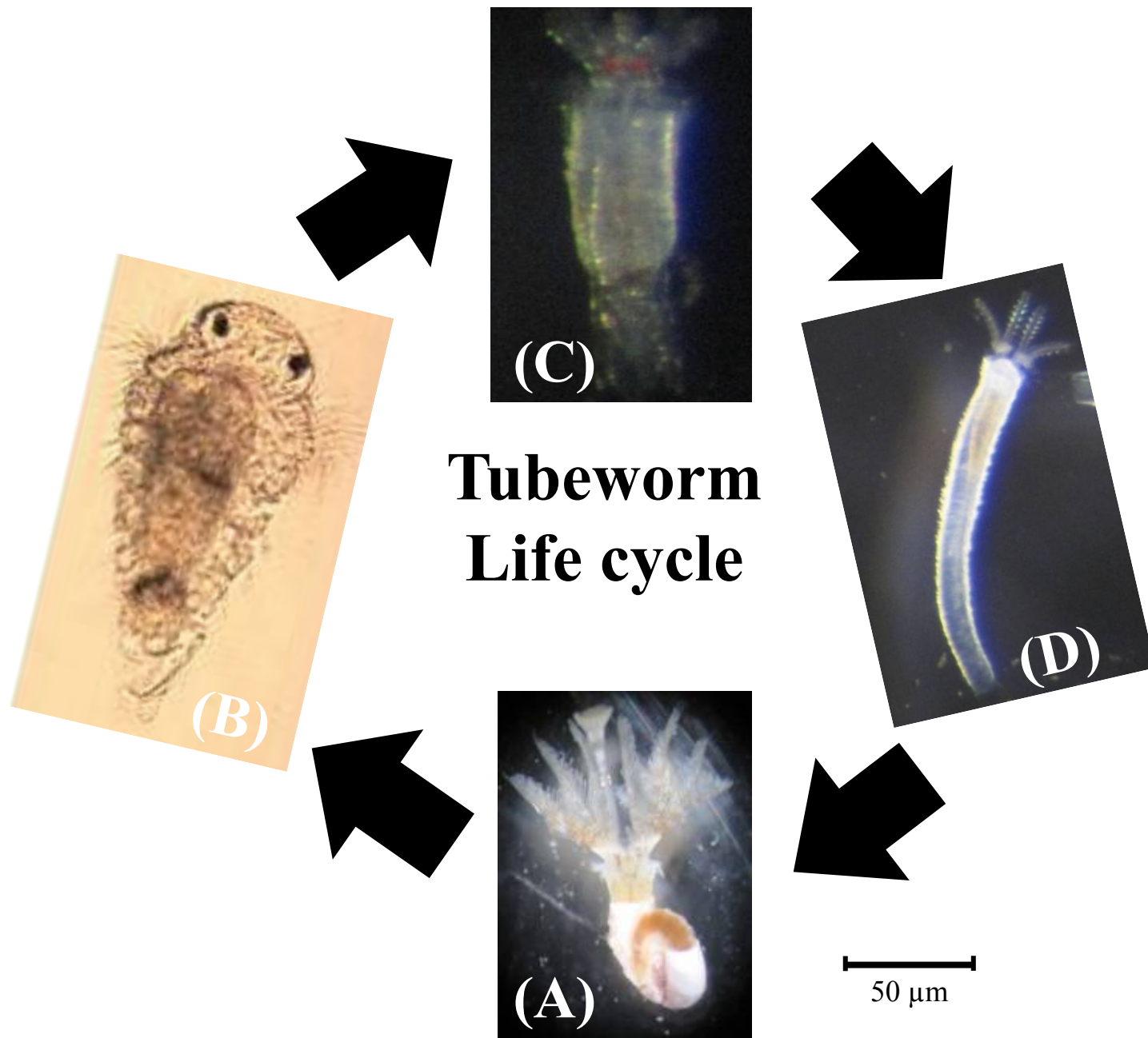


**Fig. S1.** Different developmental stages of the tubeworm *Hydroides elegans*. (A) Adult stage; (B) the competent larval stage, when they are physiologically equipped to search for a hard surface to attach and metamorphose into juveniles; (C) completely attached and metamorphosed larval stage; and (D) newly metamorphosed larvae or juvenile with calcareous ( $\text{CaCO}_3$ ) tube.

**Fig. S2.** The pH (NBS scale) (A) and dissolved oxygen ( $\text{mg O}_2 \text{ l}^{-1}$ ) levels (B) measured from 0 to 160 h post-fertilization in the control (CON), ocean acidification (OA), hypoxia (HYP) and the combined OA×HYP groups. Each data point represents the mean  $\pm$  s.d. of three replicates.

**Fig. S3.** 2-DE reproducibility analysis: 2-DE gels of total protein (A) and phosphoprotein (B) stained images of the tubeworm larvae obtained from the three biologically independent experiments of the ocean acidification (OA) treatment. R1–R3, replicate experiments.



**Figure S1**

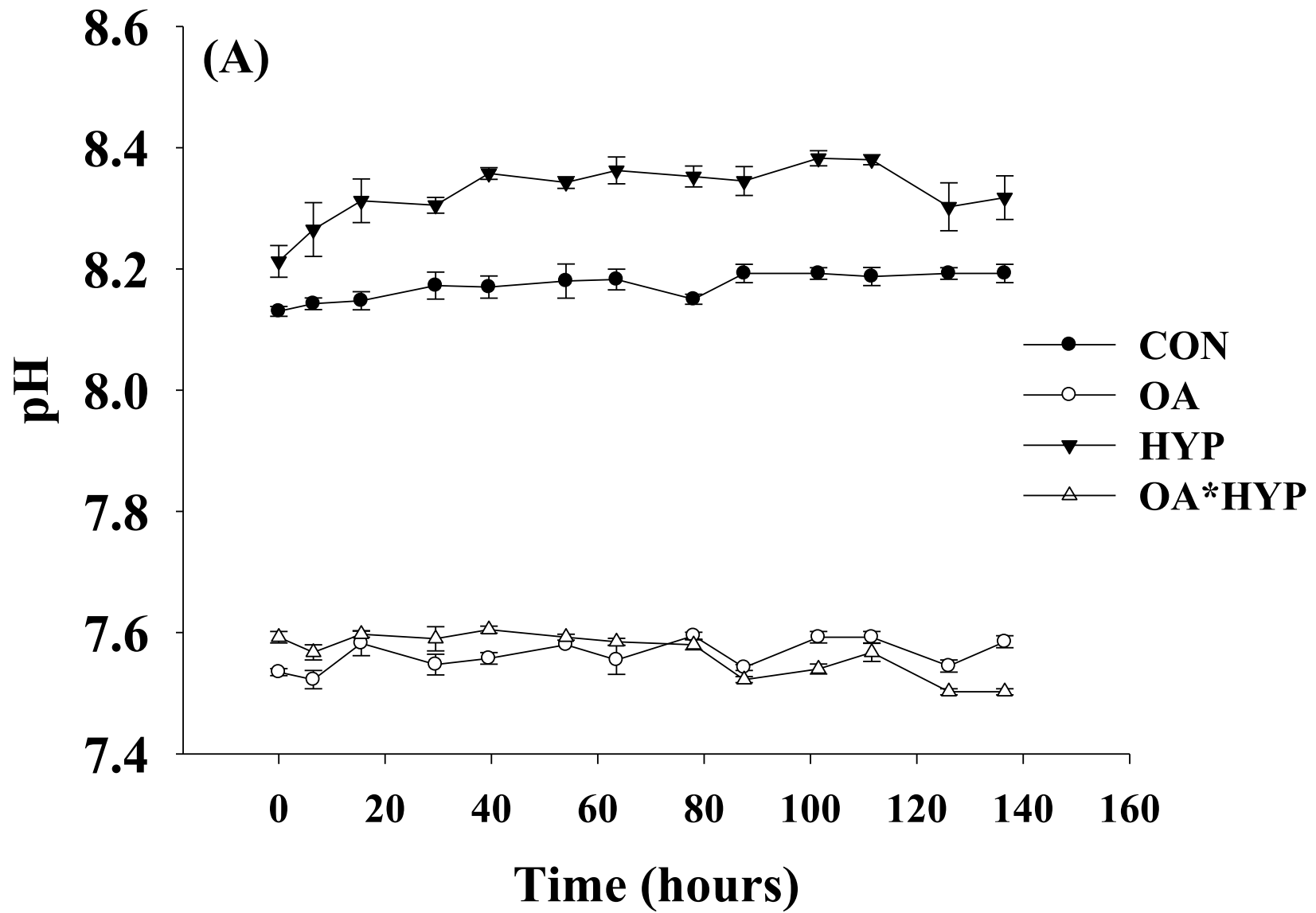
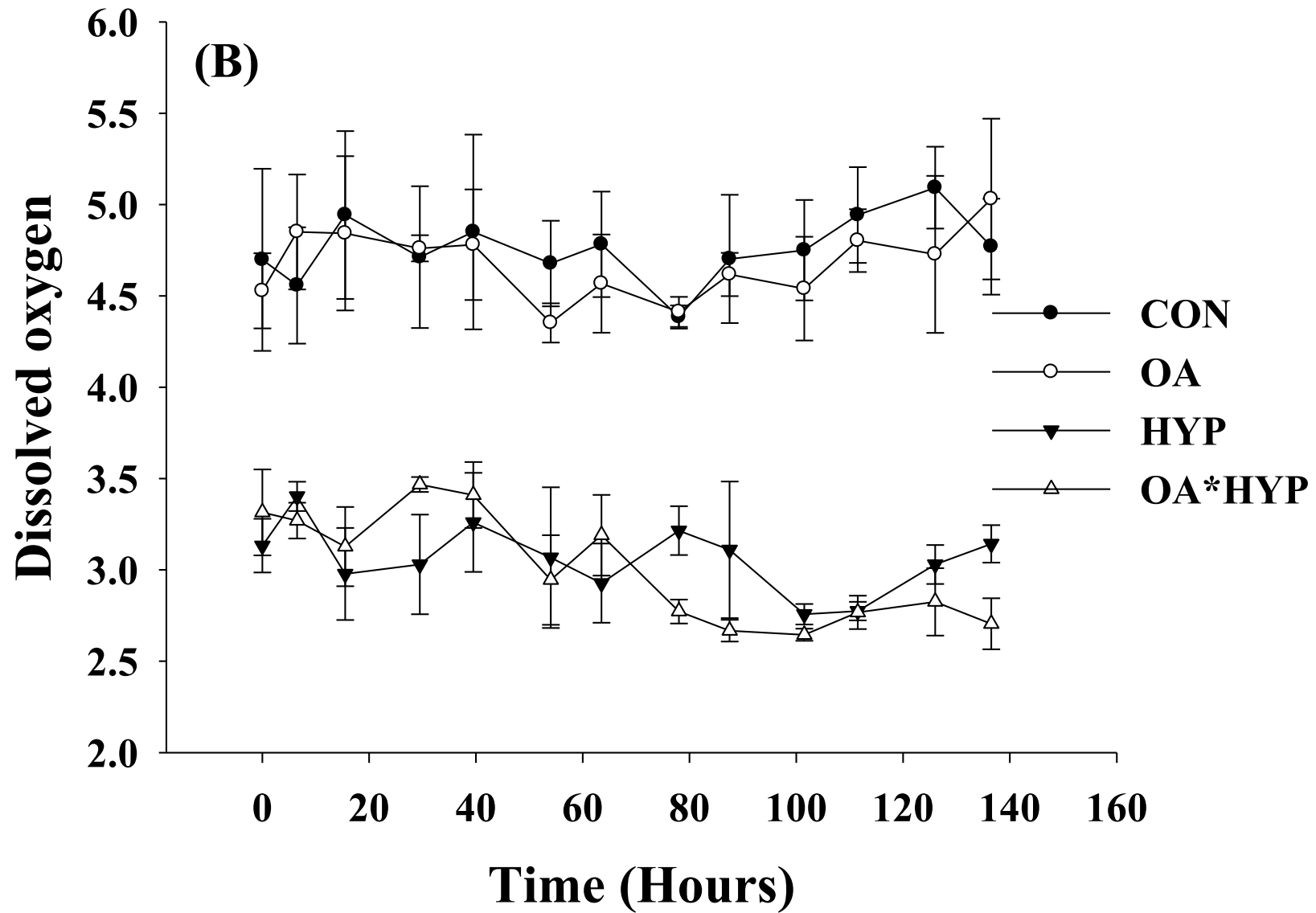
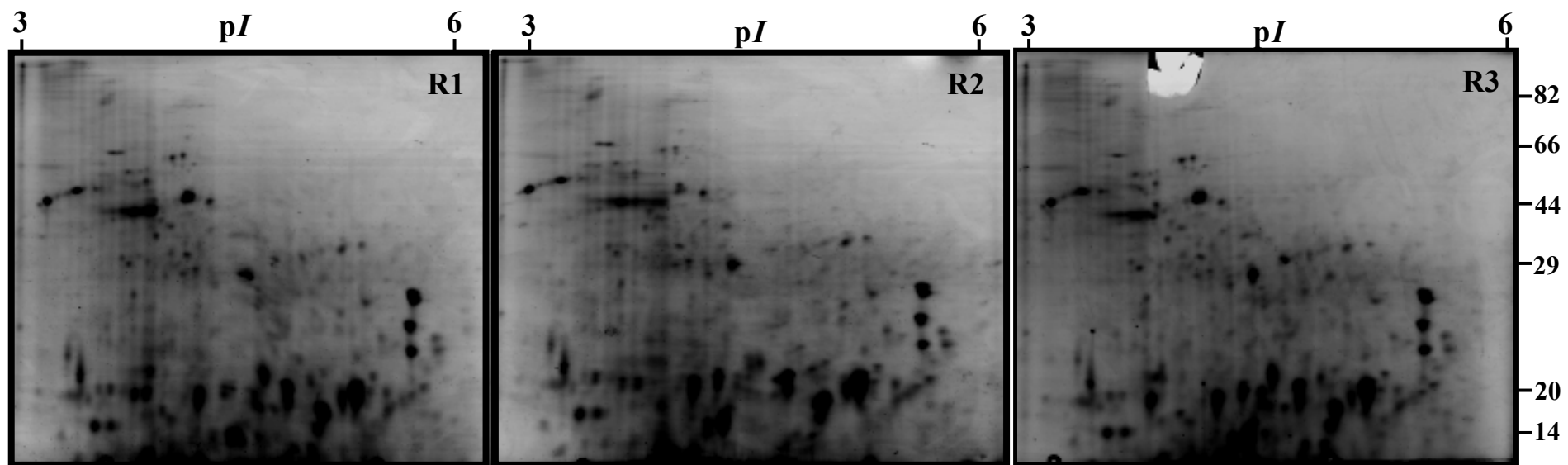


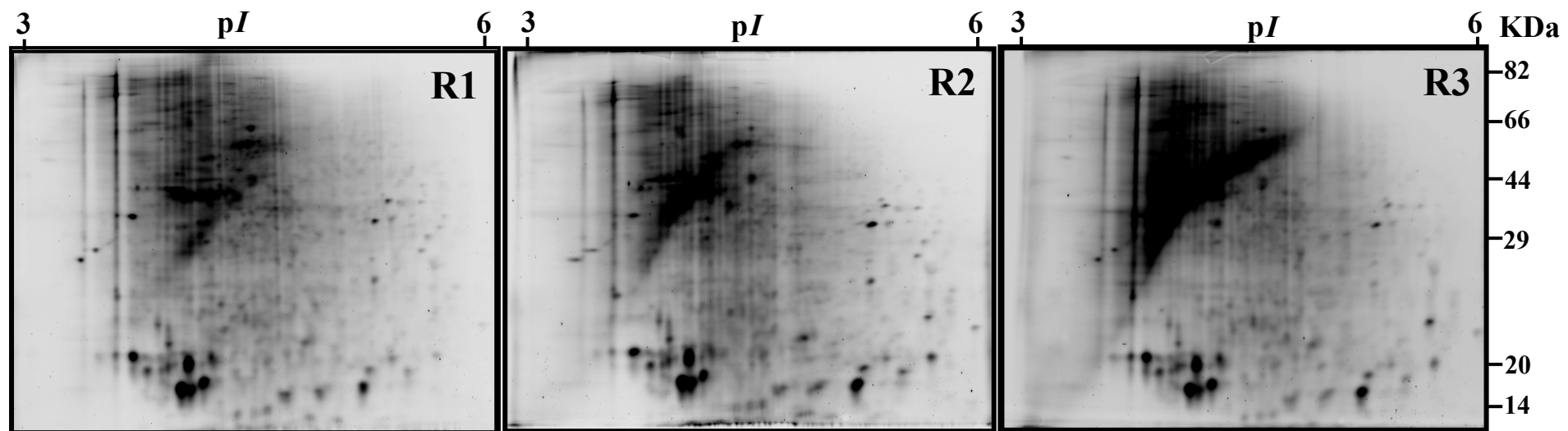
Figure S2A



**Figure S2B**



**Figure S3A**



**Figure S3B**

Table S1. Summary of measured and calculated carbonate system parameters for the four treatment conditions (CON: control, OA: ocean acidification, HYP: hypoxia) in larval culture tanks during larval growth and metamorphosis. The larval samples for proteomics analysis were collected after metamorphosis. Measured values are shown as means  $\pm$  S.D. of three replicate tanks. TA: total alkalinity;  $p\text{CO}_2$ : partial pressure of carbon dioxide ( $\text{CO}_2$ );  $\Omega_{\text{Cal}}$ : saturation state of calcite;  $\Omega_{\text{Ag}}$ : saturation state of aragonite

	Treatments	Measured				Calculated			
		$\text{pH}_{(\text{NBS})}$	Temp. ( $^{\circ}\text{C}$ )	Salinity ( $\text{‰}$ )	TA ( $\text{mmol kg}^{-1}$ )	$p\text{CO}_2$ ( $\mu\text{atm}$ )	$\text{CO}_3^{2-}$ ( $\mu\text{mol kg}^{-1}$ )	$\Omega_{\text{Cal}}$	$\Omega_{\text{Ag}}$
Larval growth	CON	8.14 $\pm$ 0.01	24.3 $\pm$ 0.5	34	2.53 $\pm$ 0.03	333	269	6.52	4.28
	OA	7.43 $\pm$ 0.02	24.6 $\pm$ 0.1	34	2.53 $\pm$ 0.02	2181	66	1.61	1.06
	HYP	8.33 $\pm$ 0.01	24.4 $\pm$ 0.3	34	2.51 $\pm$ 0.03	186	364	8.82	5.79
	OA $\times$ HYP	7.38 $\pm$ 0.04	24.8 $\pm$ 0.5	34	2.52 $\pm$ 0.03	2448	60	1.45	0.95
Larval metamorphosis	CON	8.13 $\pm$ 0.01	22.8 $\pm$ 0.3	34	2.52 $\pm$ 0.02	344	253	6.10	3.99
	OA	7.47 $\pm$ 0.06	22.6 $\pm$ 0.5	34	2.53 $\pm$ 0.01	1965	69	1.67	1.09
	HYP	8.22 $\pm$ 0.03	23 $\pm$ 0.4	34	2.51 $\pm$ 0.01	265	296	7.14	4.67
	OA $\times$ HYP	7.69 $\pm$ 0.01	23 $\pm$ 0.4	35	2.52 $\pm$ 0.03	2515	111	2.67	1.75