

## **Supplementary Information**

### **Analysis of the gut microbiota of Pacific white shrimp under industrial indoor farming system**

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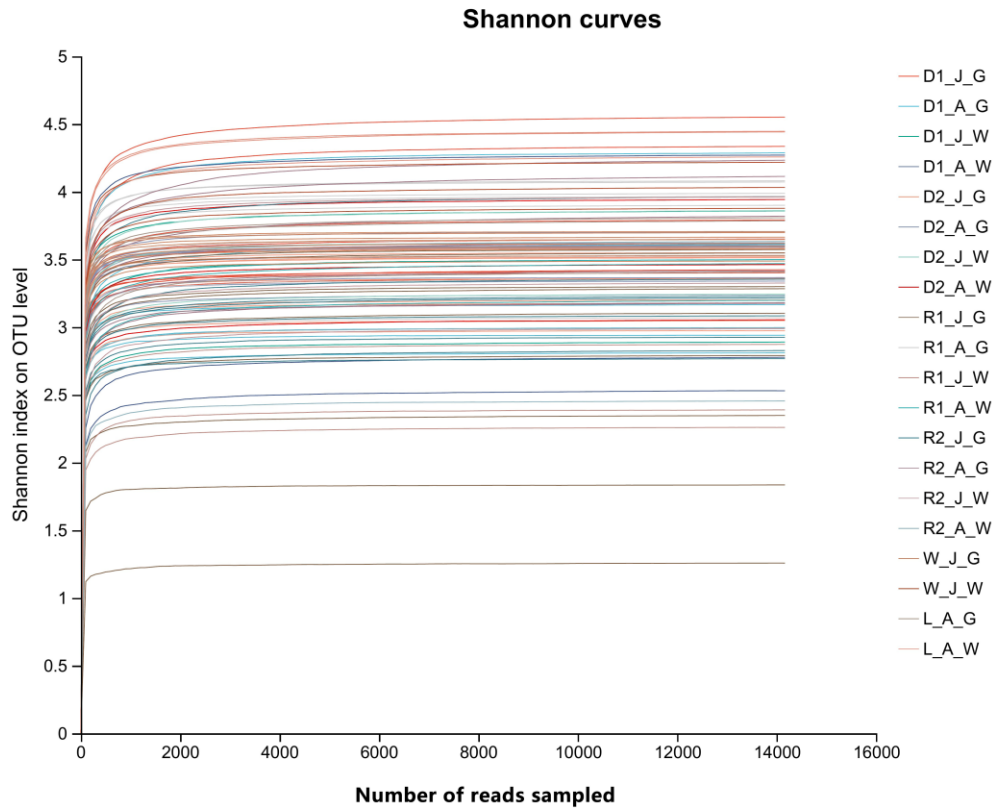
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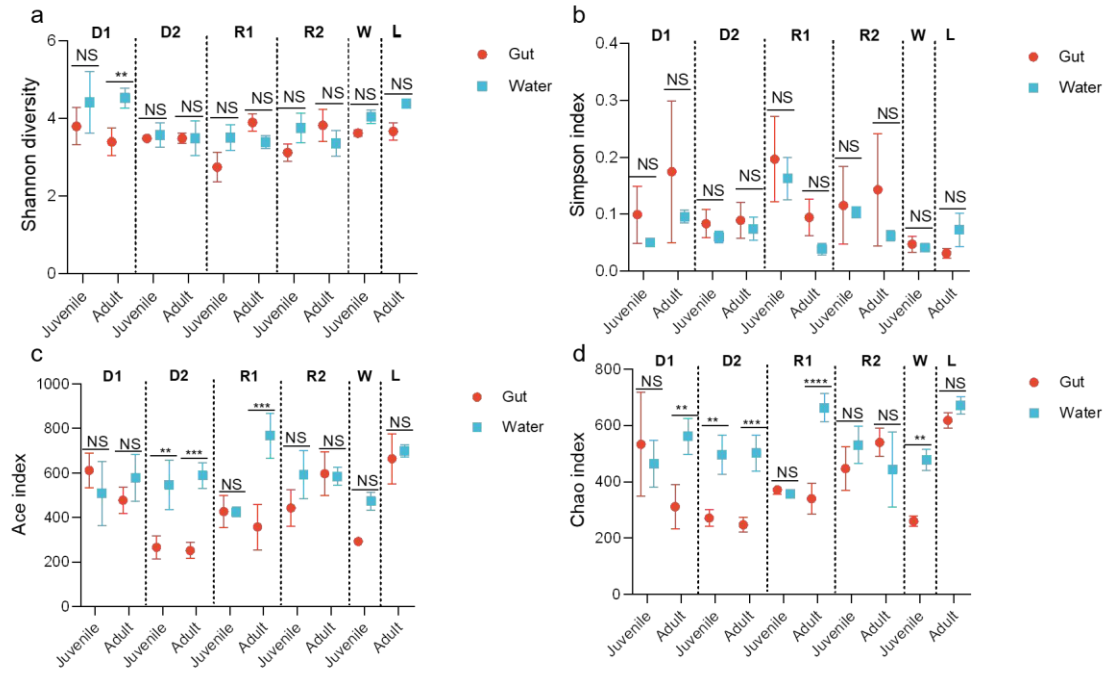
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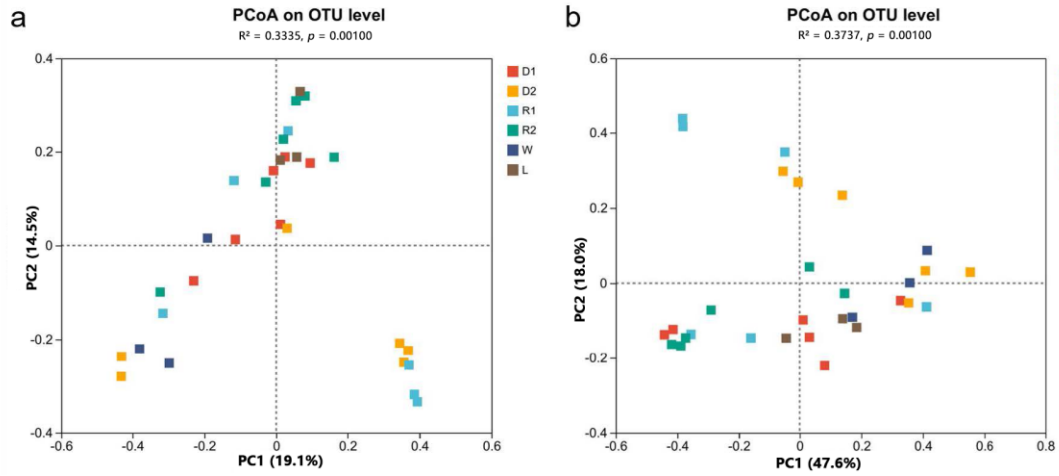
<sup>#</sup>These two authors contributed equally: Meng Li and Abdallah Ghonimy.



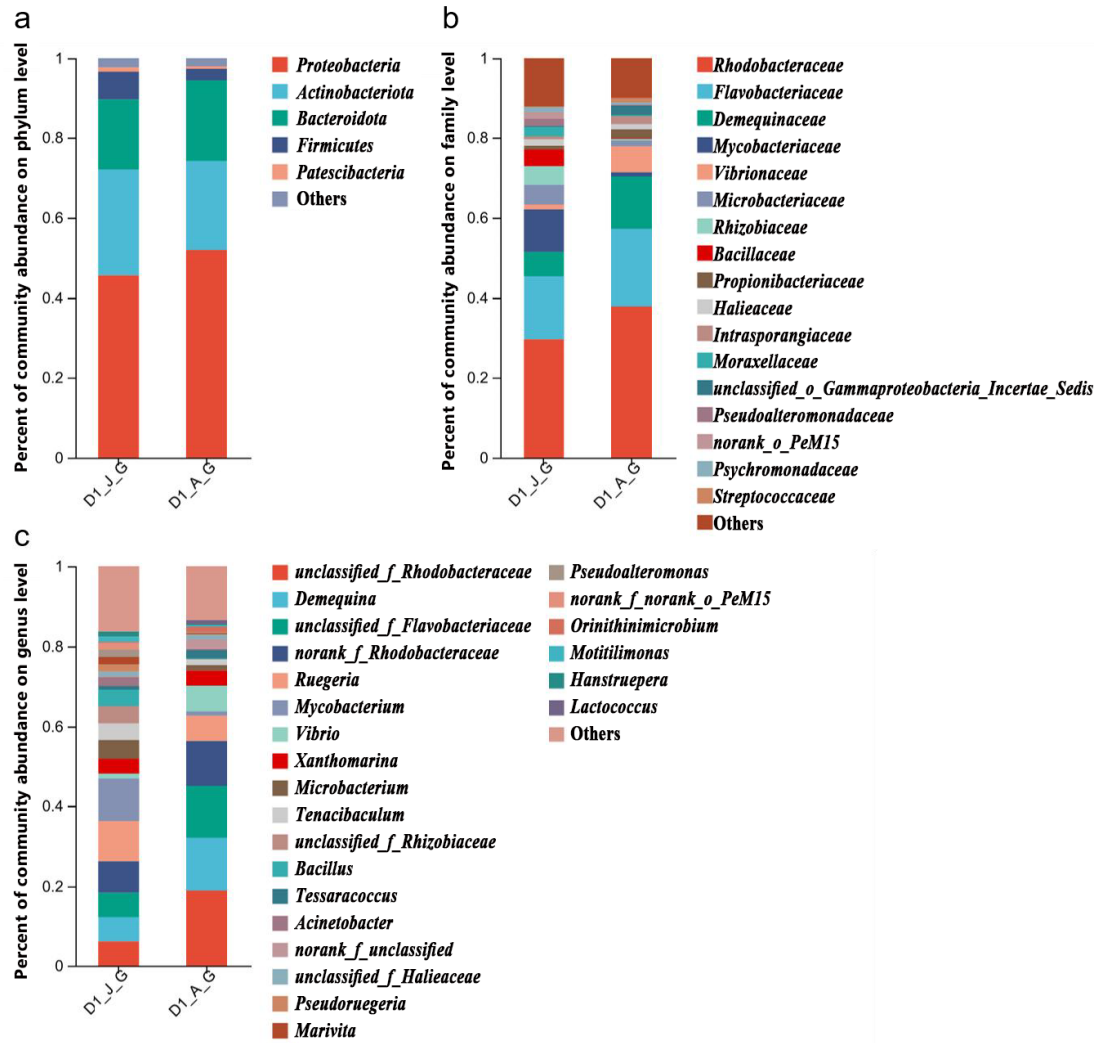
**Fig. S1** Shannon's index dilution curve of samples of *L. vannamei* shrimp gut or corresponding rearing water. D1 and D2 represent two farms in Dongying city; R1 and R2 represent two farms in Rizhao city; W represents Weihai city; and L represents Lianyungang city. J and A represent juvenile and adult, respectively. G and W represent the gut and water, respectively.



**Fig. S2** Bacterial community diversity indices in the gut and water of *L. vannamei* juveniles and adults at culture periods. D1 and D2 represent two farms in Dongying city; R1 and R2 represents two farms in Rizhao city; W represents Weihai city; L represents Lianyungang city; J and A represent juvenile and adult shrimp, respectively. Circles and squares represent shrimp gut and culture water, respectively. NS: not significant; \*:  $p < 0.05$ ; \*\*:  $p < 0.01$ ; \*\*\*:  $p < 0.001$ .

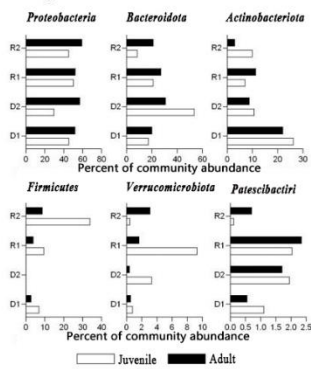


**Fig. S3** Principal coordinate analysis (PCoA) of the rearing water microbiota at each farm location based on Bray-Curtis (a) or Weighted-Unifrac (b) distances at OTU level. D1 and D2 represent two farms in Dongying city; R1 and R2 represent two farms in Rizhao city; W represents Weihai city; L represents Lianyungang city.

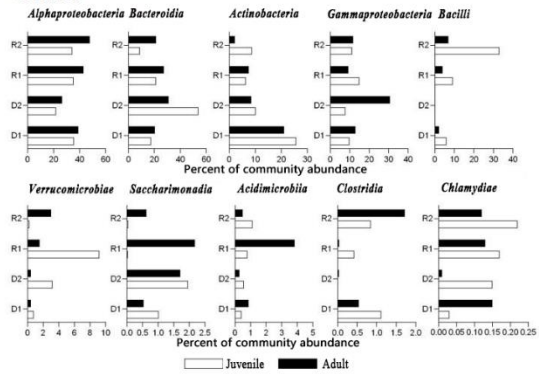


**Fig. S4** Bacterial community composition of juvenile and adult shrimp *L. vannamei* gut at phylum (a), family (b), or genus levels (c), respectively. The meaning of characters in label are as follows: The first character is the abbreviation of farm location, and D represents Dongying. The second character is the abbreviation of shrimp stage, and J represents juvenile while A represents adult. The third character is abbreviation of sample item, and G represents shrimp gut.

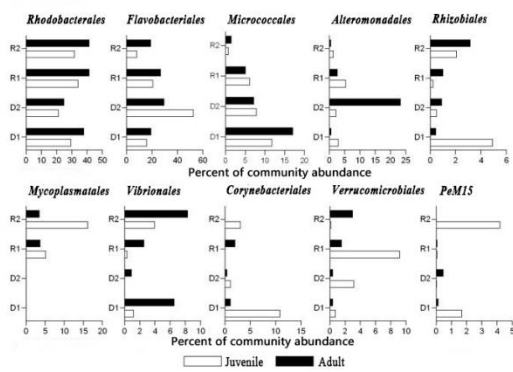
## Phylum



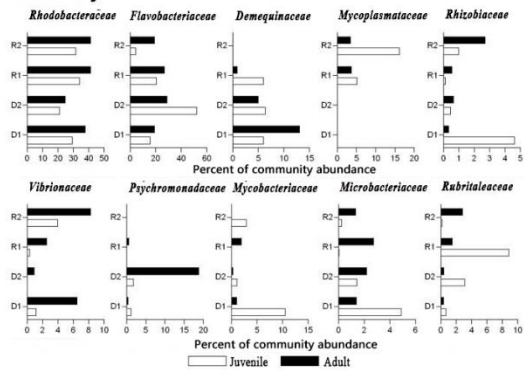
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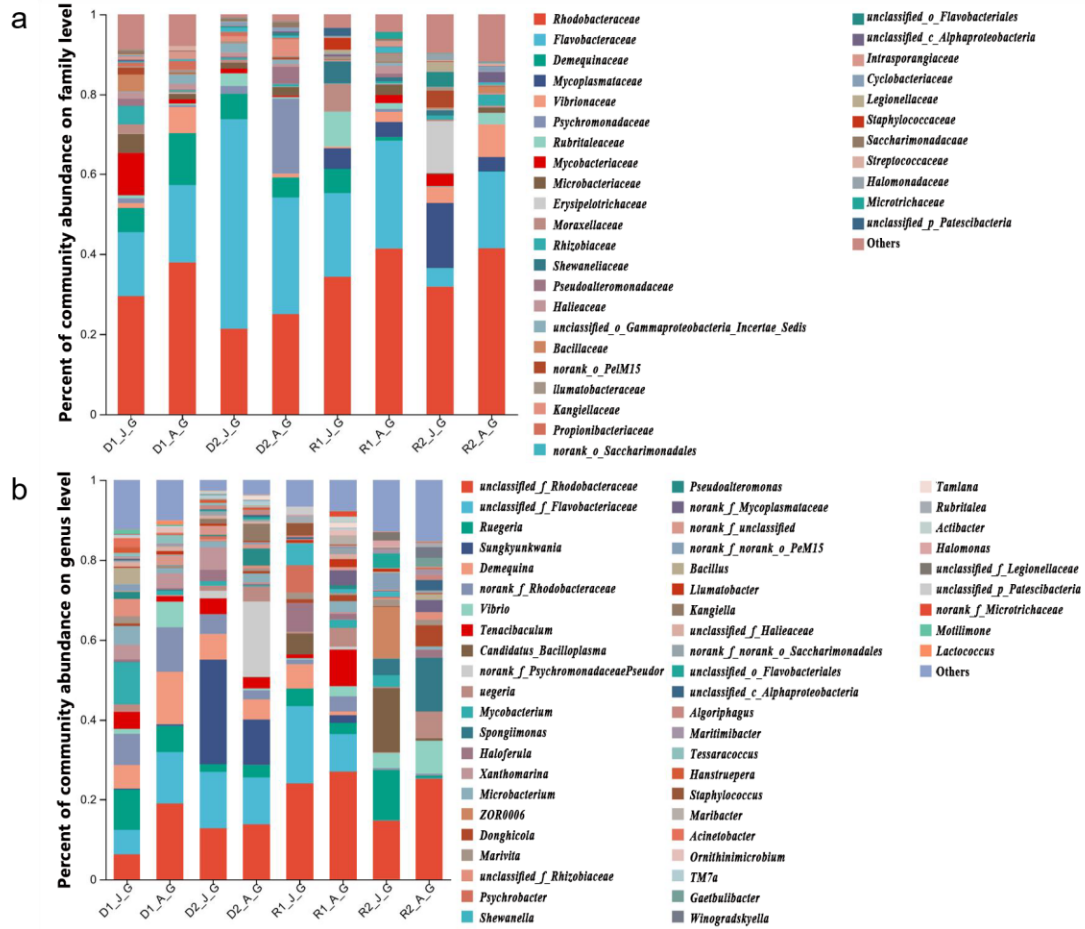
## Order



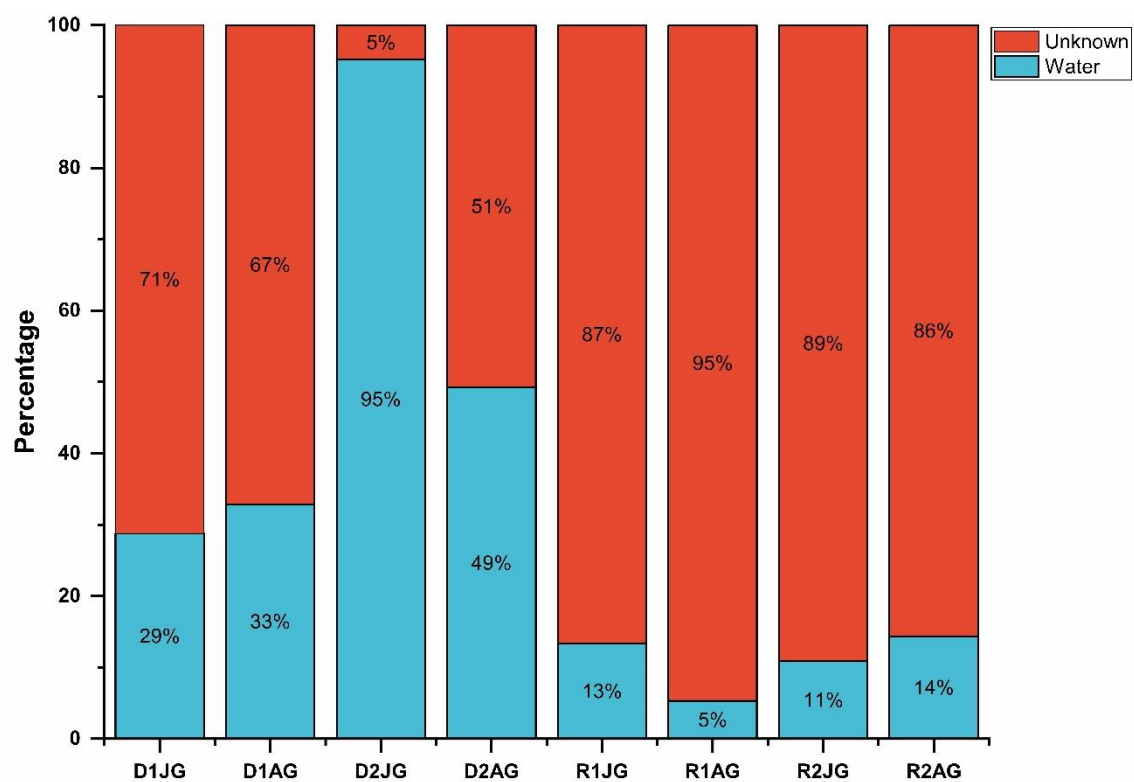
## Family



**Fig. S5** Comparison of core gut bacterial community of the juvenile and adult *L. vannamei*, raised in D1, D2, R1, and R2, at phylum, class, order and family levels, respectively. D1 and D2 represent two farms in Dongying city; R1 and R2 represent two farms in Rizhao city.

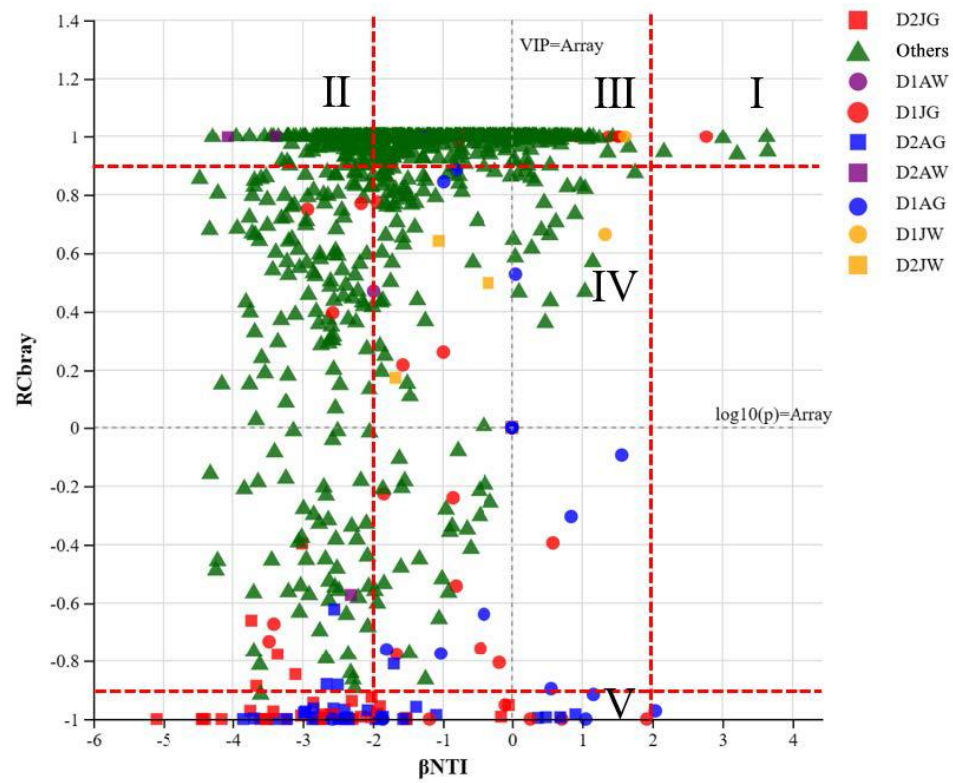


**Fig. S6** Total composition on gut bacterial community of juvenile and adult *L. vannamei*, cultured in D1, D2, R1, and R2, at family (a), or genus levels (b), respectively. The meaning of characters in label are as follows: The first character is the abbreviation of farm location, D1 and D2 represent two farms in Dongying city; R1 and R2 represent two farms in Rizhao city. The second character is the abbreviation of shrimp stage, and J represents juvenile while A represents adult. The third character is abbreviation of sample item, and G represents shrimp gut.

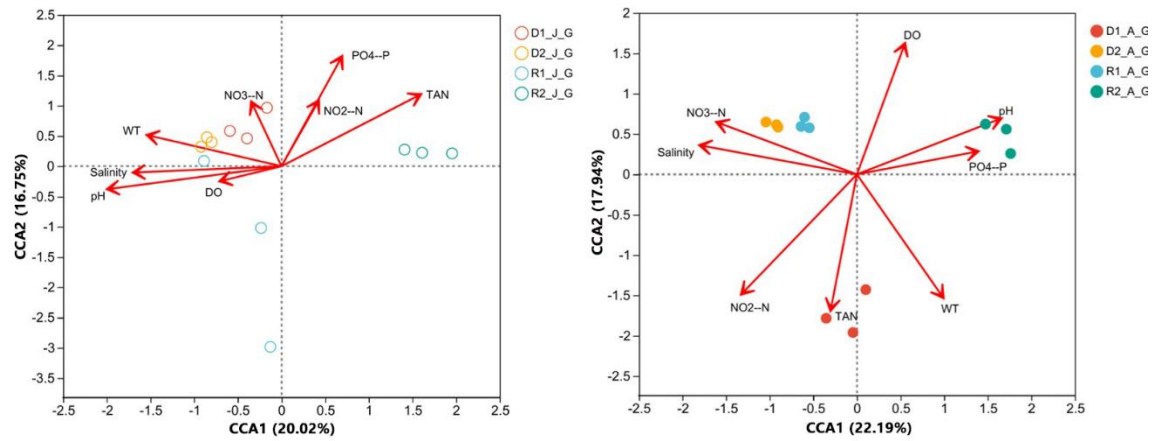


**Fig. S7** Source tracking of *L. vannamei* shrimp gut bacterial community estimated within a Bayesian framework in SourceTracker approach. As to the sample names, D1 and D2 represent two farms in Dongying city, R1 and R2 represent two farms in Rizhao city, J and A represent juvenile and adult shrimp, respectively, and G represents gut.

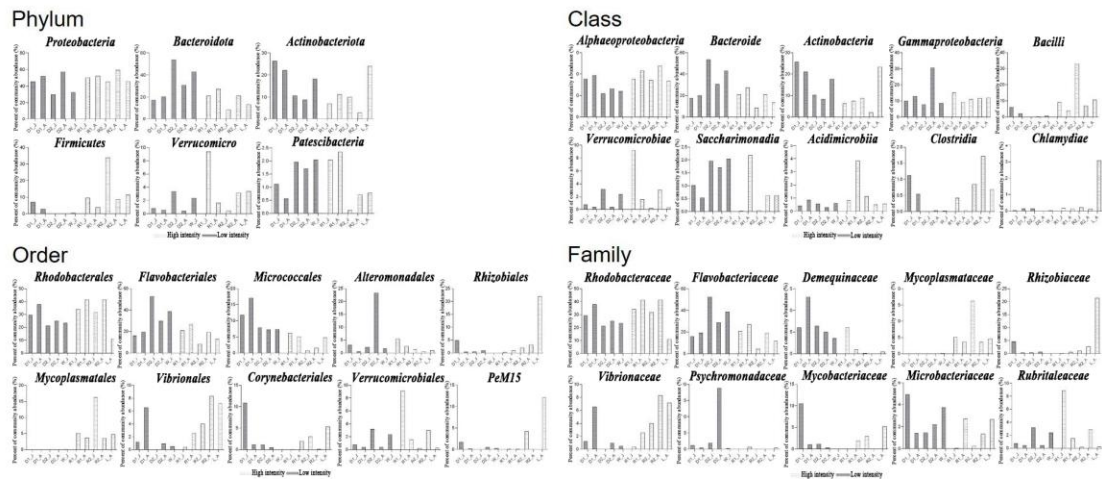




**Fig. S8** Structure analysis of bacterial community of *L. vannamei* shrimp and rearing water based on  $\beta$ NTI/RChray values. As to the sample names, D1 and D2 represent two farms in Dongying city respectively, J and A represent juvenile and adult shrimp respectively, G represents gut, and W represents rearing water.



**Fig. S9** Canonical correlation analysis (CCA) of the gut bacterial communities and rearing water quality parameters of *L. vannamei* shrimp juvenile (a) and adult (b). As to the sample names, D1 and D2 represent two farms in Dongying city, R1 and R2 represent two farms in Rizhao city, J and A represent juvenile and adult shrimp respectively, G represents gut. In the figure, WT represents water temperature, DO represents dissolved oxygen, NO<sub>3</sub>-N represents nitrate, NO<sub>2</sub>-N represents nitrite, TAN represents total ammonia nitrogen, and PO<sub>4</sub>-P represents phosphate.



**Fig. S10** Comparison of core gut bacterial community of *L. vannamei* shrimp raised under different light intensities (low and high) at phylum, class, order, and family levels respectively. The first character is the abbreviation of farm location, and D represents Dongying city, R represents Rizhao city, W represents Weihai city, and L represents Lianyungang city. The second character is the abbreviation of shrimp stage, and J represents juvenile, while A represents adult. The third character is abbreviation of sample item, and G represents shrimp gut.

**Table S1** Body weight and physiochemical conditions of the sampling *L. vannamei* at juvenile and adult stage.

Site	Shrimp body weight (g)		Light intensity/Lux		Temperature/°C		DO/ mg/L		pH		Salinity	
	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult
D1	1.73±0.71	10.63±1.99	830.8±11.5	863.0±15.4	28.97±0.67	29.00±0.10	5.81±0.71	4.70±0.03	7.79±0.11	7.34±0.13	27.96±0.10	27.96±0.02
D2	3.11±0.93	9.39±2.69	848.2±5.2	867.5±14.2	28.90±0.00	26.77±0.32	4.84±0.17	5.52±0.63	8.02±0.01	7.55±0.08	35.98±0.02	33.82±0.06
W	2.49±1.01	NA	886.3±15.6	NA	25.63±0.06	NA	4.84±0.17	NA	8.02±0.01	NA	20.26±0.41	NA
R1	1.32±0.63	8.13±3.05	1034.5±33.1	1286.3±21.0	27.20±0.50	25.00±0.21	5.68±0.12	6.19±0.62	7.90±0.02	7.26±0.07	30.49±0.04	29.35±0.74
R2	0.91±0.44	24.12±5.58	1065.8±38.4	1291.8±12.5	26.53±0.40	28.01±0.15	4.72±0.56	6.14±0.29	7.41±0.05	7.96±0.12	25.07±1.22	26.43±0.04
L	NA	20.27±4.22	NA	1166.5±37.3	NA	28.90±0.00	NA	6.66±0.36	NA	7.30±0.09	NA	35.98±0.02

The meaning of characters of sampling sites are as follows: D: Dongying, Shandong, R: Rizhao, Shandong, W: Weihai, Shandong, L: Lianyungang, Jiangsu.

**Table S2** Nutrients concentration of the rearing water collected at juvenile and adult stage *L. vannamei*.

Site	TAN*		Nitrite (mg/L)		Nitrate (mg/L)		Phosphate (mg/L)	
	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult
D1	16.14±0.33	21.41±1.52	1.60±0.03	1.81±0.05	1.83±0.34	0.47±0.02	0.09±0.01	0.08±0.00
D2	8.90±0.11	13.77±6.83	0.45±0.29	1.34±0.22	0.43±0.20	1.49±0.50	0.08±0.09	0.10±0.06
W	8.06±3.08	NA	1.75±0.07	NA	3.65±0.63	NA	0.21±0.01	NA
R1	5.63±1.70	5.16±1.25	0.36±0.01	0.57±0.06	0.20±0.01	0.69±0.12	0.06±0.01	0.07±0.01
R2	10.78±0.37	8.82±0.05	1.00±0.05	0.07±0.01	0.41±0.11	0.18±0.00	0.09±0.01	0.11±0.01
L	NA	9.73±1.20	NA	1.56±0.07	NA	0.44±0.06	NA	0.04±0.00

\* Total ammonia nitrogen.

The meaning of characters of sampling sites are as follows: D: Dongying, Shandong, R: Rizhao, Shandong, W: Weihai, Shandong, L: Lianyungang, Jiangsu