

Table S1 Taxonomic summary and GII index of prey items of *D.gigas* in the eastern equatorial Pacific

Prey	F%	N%	GII	GII Rank
Gastropoda				
Cavoliniidae				
<i>Cavolinia tridentata</i>	1.04	0.01	0.74	62
Limacinidae				
<i>Heliconoides</i> sp. 1	70.83	13.86	59.88	2
<i>Heliconoides</i> sp. 2	2.08	0.14	1.57	48
<i>Limacina</i> sp. 1	2.08	0.47	1.80	47
<i>Limacina</i> sp. 2	7.29	0.35	5.40	21
Cliidae				
<i>Clio</i> spp.	1.04	0.04	0.76	58
Crustacea				
Copepoda				
Candaciidae				
<i>Candacia curta</i>	15.32			
Euchaetidae				
<i>Euchaeta</i> spp.	2.70			
Pontellidae				
<i>Labidocera</i> spp.	25.23			
Temoridae				
<i>Temora</i> spp.	3.60			
Corycaeidae				
Unidentified Copepoda	8.11			
Gammaridae	4.17	0.08	3.01	37
Euphausiidae				
* <i>Euphausia eximia</i>	3.13	1.11	3.00	38
* <i>Euphausia recurva</i>	5.21	0.35	3.93	30
<i>Euphausia</i> spp.	4.17	0.17	3.07	33
<i>Euphausia</i> spp. Larva	1.04	0.04	0.76	59
* <i>Thysanopoda monacantha</i>	5.21	0.49	4.03	29
Pandalidae				
* <i>Plesionika richardi</i>	2.08	0.06	1.51	49
Phronimidae				
* <i>Phronima sedentaria</i>	8.33	0.22	6.05	16
Hyperiidædana				
* <i>Hyperioides longipes</i>	15.63	0.87	11.67	11
*Xanthidae	1.04	0.03	0.76	61
Portunidae				
* <i>Cronius ruber</i>	1.04	0.01	0.74	69
Unidentified crabs	1.04	0.04	0.76	60
Bivalvia				
Nuculidae	18.75	0.76	13.80	10
Actinopterygii				

Myctophidae				
<i>Bolinichthys photothorax</i>	7.29	0.24	5.32	22
<i>Ceratoscopelus</i> spp.	1.04	0.01	0.74	71
<i>Ceratoscopelus townsendi</i>	1.04	0.01	0.74	67
<i>Ceratoscopelus warmingii</i>	1.04	0.01	0.74	66
<i>Diaphus</i> spp.	2.08	0.03	1.49	54
<i>Diaphus theta</i>	2.08	0.03	1.49	53
<i>Diogenichthys atlanticus</i>	8.33	0.20	6.03	17
<i>Diogenichthys laternatus</i>	68.75	8.64	54.72	4
* <i>Hygophum atratum</i>	4.17	0.08	3.01	36
<i>Hygophum hygomii</i>	8.33	0.17	6.01	18
<i>Hygophum reinhardtii</i>	1.04	0.01	0.74	65
<i>Hygophum</i> spp.	3.13	0.06	2.26	40
* <i>Krefflichthys anderssoni</i>	9.38	0.60	7.06	14
<i>Lampanyctus parvicauda</i>	6.25	0.11	4.50	27
<i>Lampanyctus</i> spp.	19.79	0.63	14.44	9
<i>Lobianchia dofleini</i>	1.04	0.01	0.74	70
<i>Myctophum affine</i>	4.17	0.08	3.01	35
** <i>Myctophum aurolaternatum</i>	3.13	0.04	2.24	43
* <i>Myctophum lychnobium</i>	1.04	0.01	0.74	74
** <i>Myctophum nitidulum</i>	11.46	0.46	8.43	12
<i>Myctophum nitidulum</i> Larva	3.13	0.07	2.26	39
<i>Myctophum spinosum</i>	3.13	0.04	2.24	44
<i>Nannobrachium nigrum</i>	5.21	0.12	3.77	31
<i>Nannobrachium ritteri</i>	8.33	1.15	6.70	15
<i>Notoscopelus resplendens</i>	3.13	0.05	2.25	41
<i>Parvilux ingens</i>	4.17	0.25	3.13	32
<i>Symbolophorus evermanni</i>	2.08	0.03	1.49	52
** <i>Symbolophorus reversus</i>	2.08	0.04	1.50	50
<i>Triphoturus mexicanus</i>	22.92	1.42	17.21	8
Phosichthyidae				
** <i>Vinciguerria lucetia</i>	90.63	45.03	95.93	1
<i>Vinciguerria lucetia</i> Larva	53.13	8.59	43.64	5
Stomiidae				
<i>Chauliodus sloani</i>	2.08	0.03	1.49	55
Scombrida				
* <i>Auxis rochei</i>	2.08	0.01	1.48	57
Merlucciidae				
<i>Merluccius productus</i>	1.04	0.01	0.74	73
Bregmacerotidae				
* <i>Bregmaceros maclellandi</i>	4.17	0.08	3.01	34
Microstomatidae				
<i>Lipolagus ochotensis</i>	6.25	0.29	4.62	26
Paralepididae				

<i>Macroparalepis affinis</i>	1.04	0.01	0.74	63
Nomeidae				
** <i>Cubiceps pauciradiatus</i>	7.29	0.12	5.24	25
Sternoptychidae				
<i>Sternoptyx diaphana</i>	76.04	6.16	58.12	3
fish larvae	37.50	4.09	29.41	7
Unidentified fish	8.33	0.16	6.00	19
Cephalopoda				
Argonautidae				
* <i>Argonauta argo</i>	3.13	0.05	2.25	42
Pyroteuthidae				
* <i>Pterygioteuthis hoylei</i>	6.25	0.10	4.49	28
Thysanoteuthidae				
* <i>Thysanoteuthis rhombus</i>	1.04	0.01	0.74	64
Ommastrephidae				
** <i>Dosidicus gigas</i>	46.88	0.79	33.71	6
** <i>Symlectoteuthis oualaniensis</i>	10.42	0.12	7.45	13
Enoploteuthidae				
<i>Abraliopsis affinis</i>	2.08	0.02	1.48	56
** <i>Abraliopsis tui</i>	7.29	0.12	5.24	24
<i>Abraliopsis</i> spp.	1.04	0.01	0.74	72
Cranchiidae				
** <i>Cranchia scabra</i>	7.29	0.16	5.27	23
* <i>Liocranchia valdiviae</i>	2.08	0.04	1.50	51
Gonatidae				
* <i>Gonatus madokai</i>	8.33	0.15	6.00	20
<i>Gonatus onyx</i>	1.04	0.01	0.74	68
Onychoteuthidae				
<i>Onychoteuthis banksii</i>	3.13	0.03	2.23	46
** <i>Onychoteuthis meridiopacifica</i>	3.13	0.04	2.24	45

Note: "*" denotes prey items identified by DNA barcoding only; "**" denotes prey items identified by both DNA barcoding and morphological identification.

Table S2 PERMANOVA results for the stomach content analysis (n=96).

	<i>df</i>	SS	MS	F	R ²	<i>p</i>
ML	1	0.4485	0.4485	1.6625	0.0194	0.076
Sex	1	0.2696	0.2696	0.9995	0.0105	0.439
Maturity	1	0.2206	0.2206	0.8177	0.0086	0.615
Residuals	92	24.8198	0.2698		0.9615	
Total	95	25.7586			1	

df: degrees of freedom; SS: sum of squares; MS: mean squares; F: test statistics; R²: variance contribution. The same is below.

Table S3 PERMANOVA results for the stable isotope analysis (n=102).

	$\delta^{13}\text{C}$						$\delta^{15}\text{N}$					
	<i>df</i>	SS	MS	F	R ²	<i>p</i>	<i>df</i>	SS	MS	F	R ²	<i>p</i>
ML	1	2.7171	2.7171	22.6791	0.1815	0.002	1	7.9105	7.9105	13.2957	0.1094	0.001
Sex	1	0.0792	0.0792	0.6607	0.0053	0.433	1	0.0244	0.0244	0.0411	0.0003	0.836
Maturation	1	0.4341	0.4341	3.6229	0.0290	0.072	1	6.0338	6.0338	10.1414	0.0835	0.003
Residuals	98	11.7412	0.1198		0.7842		109	58.3067	0.5950		0.8067	
Total	101	14.9715			1		112	72.2755			1	

Table S4 PERMANOVA results for the analysis of fatty acid biomarkers (n=40).

	<i>df</i>	SS	MS	F	R ²	<i>p</i>
ML	1	40.1741	40.1741	5.3606	0.1240	0.0070
Sex	1	9.8345	9.8345	1.3123	0.0304	0.2440
Maturation	1	4.1245	4.1245	0.5504	0.0127	0.5450
Residuals	36	269.7943	7.4943		0.8329	
Total	39	323.9273			1	

Table S5 Fatty acid profiles (lipids as a % of total fatty acids), carbon, and nitrogen isotopic data ($\delta^{13}\text{C}$ and $\delta^{15}\text{N}$, ‰) of the muscle tissues of *D. gigas* from the central equatorial Pacific Ocean (Mean \pm standard deviation [SD]).

Range	Group I	Group II	<i>p</i> -value
	ML \leq 250 mm	ML $>$ 250 mm	
Fatty acid			
C14:0	0.93 \pm 0.08	1.03 \pm 0.16	*
C15:0	0.72 \pm 0.1	0.82 \pm 0.21	0.07
C16:0	21.19 \pm 0.83	19.78 \pm 1.51	**
C17:0	1.19 \pm 0.11	1.28 \pm 0.18	0.07
C18:0	6.45 \pm 0.46	6.13 \pm 0.66	0.09
C20:0	0.37 \pm 0.09	0.49 \pm 0.2	*
C21:0	0.26 \pm 0.07	0.36 \pm 0.16	*
C22:0	0.33 \pm 0.09	0.46 \pm 0.20	*
C23:0	0.33 \pm 0.10	0.41 \pm 0.22	0.17
C24:0	0.31 \pm 0.09	0.39 \pm 0.18	0.09
ΣSFAs	32.08\pm0.6	31.16\pm1.18	**
C14:1n5	0.29 \pm 0.14	0.30 \pm 0.25	0.93
C15:1n5	0.25 \pm 0.18	0.43 \pm 0.25	*
C16:1n7	0.49 \pm 0.10	0.63 \pm 0.22	*
C17:1n7	0.23 \pm 0.17	0.41 \pm 0.23	**
C18:1n9	1.79 \pm 0.17	2.04 \pm 0.4	*
C20:1n9	4.65 \pm 0.23	5.03 \pm 0.56	*
C22:1n9	0.41 \pm 0.12	0.60 \pm 0.14	**
C24:1n9	0.30 \pm 0.08	0.42 \pm 0.16	**
ΣMUFAs	8.41\pm0.78	9.86\pm1.12	**
C18:2n6	0.61 \pm 0.35	0.72 \pm 0.51	0.48
C18:3n3	0.33 \pm 0.09	0.46 \pm 0.2	*
C18:3n6	0.23 \pm 0.13	0.37 \pm 0.17	*
C20:2	0.57 \pm 0.1	0.69 \pm 0.16	**
C20:3n3	1.11 \pm 0.35	1.67 \pm 0.65	**
C20:3n6	0.27 \pm 0.10	0.37 \pm 0.20	0.09
C20:4n6	1.88 \pm 0.30	2.34 \pm 0.32	**
C20:5n3	10.40 \pm 0.52	10.00 \pm 0.70	*
C22:2n6	3.71 \pm 0.27	3.76 \pm 0.29	0.55
C22:6n3	40.39 \pm 1.05	38.62 \pm 2.11	**
ΣPUFAs	59.51\pm0.72	58.98\pm1.20	0.12
Stable isotope			
$\delta^{13}\text{C}$	-17.96 \pm 0.22	-18.23 \pm 0.42	***
$\delta^{15}\text{N}$	9.65 \pm 0.71	9.17 \pm 0.87	***

SFAs: saturated fatty acids; MUFAs: monounsaturated fatty acids; PUFAs: polyunsaturated fatty acids.

Main FAs families are in bold.

n is the number of samples for stable isotopes and fatty acid analyses.*** represents $p < 0.001$; ** represents $p < 0.01$; * represents $p < 0.05$

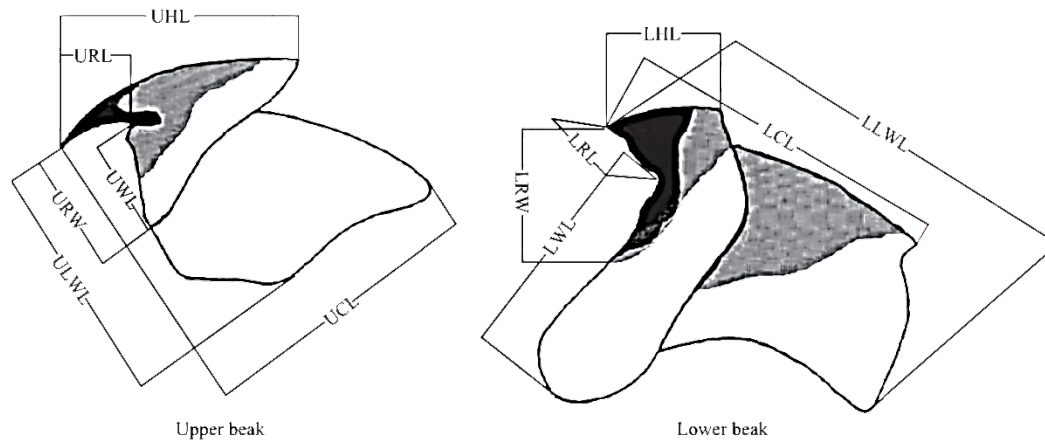


Fig. S1 Scheme of the measurement for the external morphology of the beak (cited from Fang et al. 2015). Upper hood length (UHL), upper crest length (UCL), upper rostrum length (URL), upper rostrum width (URW), upper wing length (UWL), upper lateral wall length (ULWL), lower hood length (LHL), lower crest length (LCL), lower rostrum length (LRL), lower rostrum width (LRW), lower wing length (LWL), lower lateral wall length (LLWL)

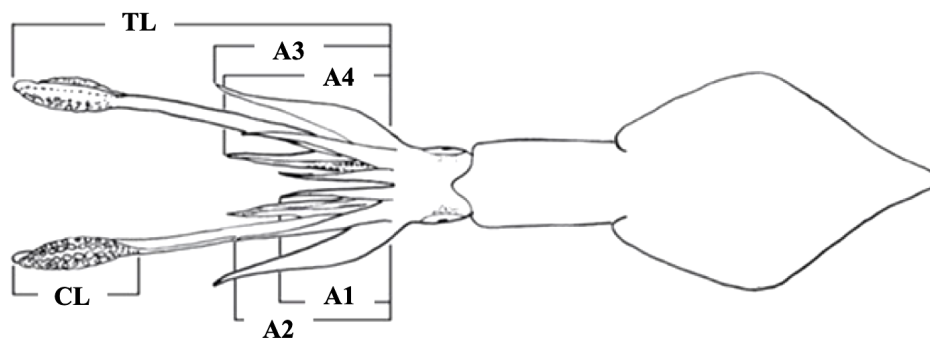


Fig. S2 Schematic diagram of the morphometric variables of the arms and tentacles. Length of each of the four arms (A1-A4), tentacular club length (CL), tentacle length (TL) (cited from Gong et al. 2018).

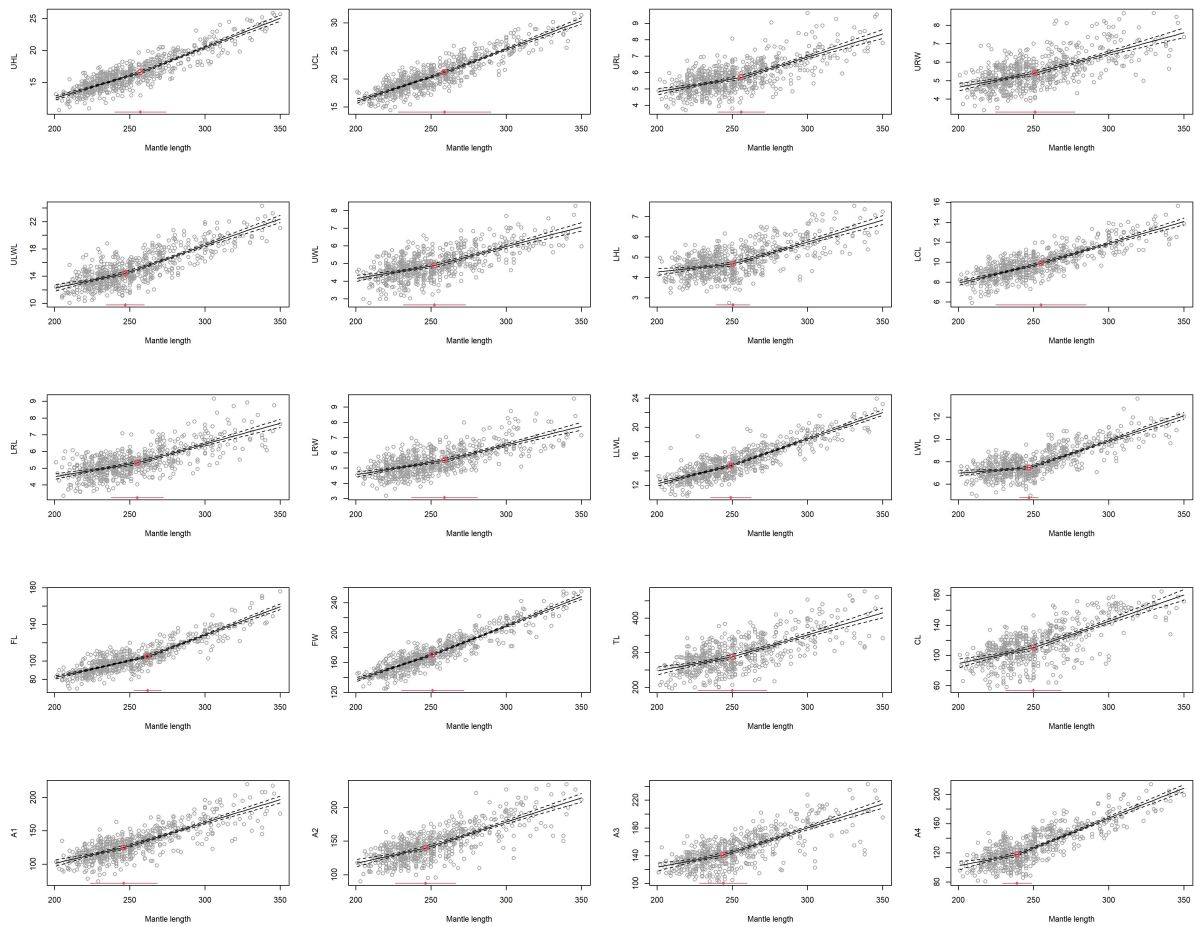


Fig. S3 The piecewise linear regression of the growth of the morphological characteristics of beaks, tentacles, and fin versus mantle length (ML).

Note: the red dots in the plots represent the breakpoints. The red lines in the x-axis indicate the 95% confidence interval.

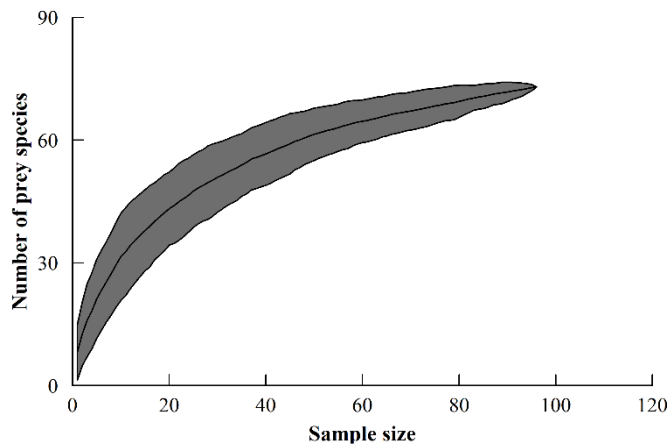


Fig. S4 Cumulative prey curve for *Dosidicus gigas* sampled in the eastern equatorial Pacific

Reference

- Fang Z, Xu L, Chen X, Liu B, Li J, Chen Y (2015) Beak growth pattern of purpleback flying squid *Sthenoteuthis oualaniensis* in the eastern tropical Pacific equatorial waters. Fish Sci 81: 443–452
<https://dx.doi.org/10.1007/s12562-015-0857-8>
- Gong Y, Ruiz-Cooley RI, Hunsicker ME, Li Y, Chen X (2018) Sexual dimorphism in feeding apparatus and niche partitioning in juvenile jumbo squid *Dosidicus gigas*. Mar Ecol Prog Ser 607: 99–112
<https://doi.org/10.3354/meps12768>