Supplement of Biogeosciences, 17, 455–473, 2020
https://doi.org/10.5194/bg-17-455-2020-supplement

Biogeosciences
Open Access

Supplement of

Zooplankton diel vertical migration and downward C flux into the oxygen minimum zone in the highly productive upwelling region off northern Chile

Pritha Tutasi and Ruben Escribano

Correspondence to: Pritha Tutasi (prithatutasi@udec.cl)

Table S1. Sampling data for Multinet tows by day (D) and at night (N) for five depth strata at three stations off northern Chile, during spring 2015.

Station	Haul	Date	Time	Latitude	Longitude	Sampling Depth (m)
St. T5	D1a	29/11/2015	9:30	-20.05	-70.53	0-600
	D1b	29/11/2015	16:30	-20.05	-70.53	0-600
	N1a	30/11/2015	2:30	-20.05	-70.53	0-600
	N1b	30/11/2015	4:30	-20.05	-70.53	0-600
	D2a	30/11/2015	10:30	-20.05	-70.53	0-600
	D2b	30/11/2015	15:00	-20.05	-70.53	0-600
	N2a	30/11/2015	22:30	-20.05	-70.53	0-600
	N2b	01/12/2015	4:30	-20.05	-70.53	0-600
St. T3	D1a	02/12/2015	14:30	-20.07	-70.25	0-600
	D1b	02/12/2015	18:00	-20.07	-70.25	0-600
	N1a	03/12/2015	0:15	-20.07	-70.25	0-600
	N1b	03/12/2015	5:00	-20.07	-70.25	0-600
	D2a	03/12/2015	12:00	-20.07	-70.25	0-600
	D2b	03/12/2015	16:00	-20.07	-70.25	0-600
	N2a	04/12/2015	23:30	-20.07	-70.25	0-600
	N2b	05/12/2015	0:15	-20.07	-70.25	0-600
St. L6	D1	09/12/2015	10:31	-29.29	-71.36	0-600
	N1	09/12/2015	22:30	-29.29	-71.36	0-600
	D2	10/12/2015	8:14	-29.29	-71.36	0-600
	N2	10/12/2015	5:00	-29.29	-71.36	0-600

Table S2. Depth intervals representing distinctive microhabitats characterized by specific depth and oxygen concentration and the mean temperature (T°) in each stratum.

Depth intervals	Strata microhabitats	ST-T5		ST-T3		ST-L6		Reference
		O_2	T°	O_2	T°	O_2	T°	
0-30	OX-ML	>200 µM	20	>200 µM	19	>200 µM	14	Oxygenated Layer (Paulmier *et al.,* 2006).
30-90	OMZ-UB	45 µM	16	45 µM	15	45 µM	13	45 µM O_2 definite as upper boundary of the OMZ (Escribano *et al.,* 2009; Hidalgo *et al.,* 2005; Escribano et al., 2004; Morales *et al.,* 1999)
90-150	OMZ-UC	< 20 µM	14	< 20 µM	13	< 20 µM	13	O_2 <20-<1 µM defined as OMZ core Paulmier et al. (2006).
150-400	OMZ-LC	1 µM O_2	12	1 µM O_2	12	4 µM O_2	12	O_2 >1-20 µM defined as OMZ core Paulmier *et al.* (2006).
400-600	OMZ-LW	> 20 µM O_2	9	> 20 µM O_2	8	Non CTD data	8	slope break > 20µM O2

Table S3. Regressions equations between body area and dry weight (dw) given by Lehette and Hernandez Leon (2009) and Marcolini *et al.* (2015) to estimate biomass with the ZooScan Integrated System. Conversion factors used for biomass estimation for 27 taxonomic groups were extracted from Kiørboe (2013) and Childress and Nygaard (1973).

Group	ACRONYM	a	b	Size	Conversion factor (C:DW)
Amphipods	AM	49.58	1.48	Area	0.345
Annelids	AN	43.38	1.54	Area	0.299
Appendicularia	AP	2.62E-08	2.83	L	0.407
Bryozoa L.	BRY	43.38	1.54	Area	0.432
Chaetognaths	CH	23.45	1.19	Area	0.367
Ctenophora	CT	43.38	1.54	Area	0.051
Small Sub C	SC	45.25	1.59	Area	0.480
Large Sub C	LC	45.25	1.59	Area	0.480
Acartia Sub C	AC	45.25	1.59	Area	0.480
Eucalanidae C	EC	76.71	0.63	Area	0.480
Decapods	DE	49.58	1.48	Area	0.419
Euphausiids	EU	49.58	1.48	Area	0.419
Fish Egg	FE	1.40E-10	1	Volume	0.407
Foraminifera	FO	89	1	Volume	0.407
Gastropods	GA	43.38	1.54	Area	0.227
Hydrozoa	HY	43.17	1.02	Area	0.132
Ichthyoplankton	IC	43.38	1.54	Area	0.438
Decapoda L	DL	43.38	1.54	Area	0.419
Echinoderm L	EL	43.38	1.54	Area	0.407
Nauplius L	NL	43.38	1.54	Area	0.407
Cirripedia L	CL	43.38	1.54	Area	0.407
Ostracoda	OS	99.46	1.28	Area	0.369
Platyhelminthes	PL	43.38	1.54	Area	0.407
Pteropoda	PT	43.38	1.54	Area	0.289
Radiolaria	RA	43.38	1.54	Area	0.407
Salps sp	SA	4.03	1.24	Area	0.109
Siphonophores	SI	43.17	1.02	Area	0.109

Table S4. Mean and Standard Deviation (±) of integrated abundance (ind. m^{-2} d^{-1}) by taxonomic groups sorted in this study during daytime/ night condition at three stations off northern Chile, during spring 2015.

TAXA	T5			T3			L6		
	Abundance 0-600		**SD**	**Abundance 0-600**		**SD**	**Abundance 0-600**		**SD**
Copepods									
Small Copepods	180698	±	44460	94735	±	24291	230268	±	46919
Large Copepods	11384	±	2813	5961	±	1327	26840	±	4536
Acartia Copepod	3	±	1	0	±	0	200	±	83
Eucalanidae Copepod	3	±	1	20	±	6	44	±	9
Euphausiids	434	±	82	341	±	66	1683	±	473
Decapoda Larvae	428	±	132	292	±	62	400	±	88
Chaetognaths	972	±	228	843	±	191	4755	±	1038
Annelids	3110	±	462	2824	±	422	7395	±	847
Fish Eggs	4304	±	672	5759	±	1020	20848	±	4618
Nauplius larvae	1720	±	462	1014	±	333	27837	±	9587
Appendicularian	10924	±	3208	5646	±	2098	11034	±	3568
Salps	995	±	218	3193	±	817	10347	±	3219
Ostracods	1342	±	234	2819	±	561	9899	±	1199
Siphonophores	3649	±	1243	2487	±	823	4616	±	1183
Hydrozoan	746	±	150	525	±	94	4397	±	1401
Foraminiphers	128	±	9	94	±	13	3564	±	370
Gastropods	450	±	115	180	±	24	1806	±	435
Platyhelminthes	0	±	0	0	±	0	2410	±	1054
Cirripedia Larvae	112	±	28	58	±	11	2190	±	839
Bryozoan	113	±	29	63	±	15	298	±	120
Amphipods	44	±	9	195	±	41	116	±	27
Pteropods	152	±	64	19	±	5	135	±	39
Ctenophores	1	±	0	14	±	6	119	±	38
Echinoderm larvae	7	±	3	0	±	0	18	±	8
Radiolarian	1	±	0	4	±	2	14	±	5
Decapods	11	±	3	0	±	0	0	±	0
Ichthyoplankton	4	±	1	1	±	0	0	±	0
Total ind. m^2	221735	±	53698	127085	±	31229	371235	±	76618

Table S5- Daily average of relative abundance (%) for the 27 zooplankton groups sorted in this study during daytime/ night condition at three stations off northern Chile, during spring 2015. Each depth stratum represents a specific oxygen condition.

TAXA	St. T5						St. T3						St. L6					
	OX ML	OMZ				Total	OX ML	OMZ				Total	OX ML	OMZ				Total
		UB	UC	LC	LW			UB	UC	LC	LW			UB	UC	LC	LW	
								Major Groups										
COPEPODS						**87**						**79**						**69**
SC	46	27	4	1	2	81	47	17	8	1	2	75	32	17	5	3	4	62
LC	3	2	< 1	< 1	< 1	5	3	1	< 1	< 1	< 1	5	3	3	1	< 1	1	7
AC	0	< 1	0	0	0	< 1	0	0	0	0	0	0	< 1	0	< 1	0	0	< 1
EC	0	0	0	< 1	< 1	< 1	0	< 1	0	0	< 1	< 1	< 1	0	< 1	< 1	0	< 1
FE	1	< 1	< 1	< 1	< 1	**2**	2	1	< 1	1	< 1	**5**	2	3	< 1	< 1	< 1	**6**
NL	< 1	< 1	< 1	< 1	< 1	**< 1**	< 1	< 1	< 1	< 1	< 1	**< 1**	6	1	< 1	< 1	< 1	**7**
AP	3	1	< 1	< 1	< 1	**5**	4	< 1	< 1	< 1	< 1	**4**	2	1	< 1	< 1	< 1	**3**
OTHERS	3	2	1	1	< 1	**<6**	5	3	1	1	< 1	**11**	6	6	1	1	1	**15**

Table S6- Carbon respiration (mg C m^{-2} d^{-1}) in the Oxygen minimum zone (90-600 m) by zooplankton groups sorted in this study during daytime/ night condition at three stations off northern Chile, during spring 2015. Respiration rate was estimated using regression provided by Ikeda (1985).

Taxa	St. T5	St. T3	St. L6
Amphipods	0.06	0.16	0.68
Annelids	4.77	7.23	13.09
Appendicularia	0.00	0.00	0.00
Bryozoan	0.00	0.00	0.00
Chaetognaths	0.62	0.58	6.72
Cirripedia L	0.00	0.02	0.04
Ctenophores	0.05		0.08
Acartia C			0.03
Eucalanidae C	0.01	0.09	0.48
Large C	7.28	7.23	38.94
Small C	12.14	12.29	21.27
Decapods	2.63		
Decapods L	0.21		
Euphausiids	6.51	7.17	33.41
Fish Egg	0.00	0.00	0.00
Foraminiphers	0.06	0.06	0.62
Gastropods	0.01	0.04	0.14
Hydrozaa	0.34	1.18	3.58
Ichthyoplankton	0.07	0.40	
Nauplius L	0.02	0.02	0.24
Ostracods	1.61	2.59	15.57
Platyhelminthes			0.83
Pteropods	0.00	0.00	0.00
Radiolarian	0.00	0.02	0.03
Salps	0.14	0.45	0.24
Siphonophores	0.16	0.17	0.75

Table S7- Migrant biomass (mg C m^{-2}) for taxonomic groups of zooplankton sampled in the deep stratum (90-600 m) at northern Chile at 3 stations: off Iquique (Stations T5 and T3) and off Coquimbo (Station L6) during the austral spring 2015. SD= Standard deviation of the migrant biomass estimated from n=4 (St. T5 and St. T3) and n=2 (St. L6).

	T5			T3			L6		
TAXA	**MB**		**SD**	**MB**		**SD**	**MB**		**SD**
Decapoda_L	3.7	±	3.5	446.7	±	257.9	847.6	±	485.5
Euphausiids	389.1	±	214.6	330.0	±	158.4	123.7	±	96.7
Large C	17.3	±	11.6	4.3	±	3.0	157.5	±	110.5
Small C	18.4	±	10.8	25.3	±	13.5	31.0	±	53.3
Eucalanid C	0.3	±	0.2	3.3	±	1.9	14.4	±	12.4
Acartia C	0.0	±	0.0	0.0	±	0.0	0.0	±	0.0
Annelida	8.6	±	15.9	31.1	±	39.4	83.4	±	57.5
Ichthyoplankton	4.9	±	7.7	50.1	±	28.9	0.0	±	0.0
Ostracoda	3.3	±	2.2	8.5	±	4.7	42.9	±	41.9
Chaetognaths	35.5	±	20.1	0.9	±	0.9	3.8	±	21.2
Hydrozaa	3.2	±	2.0	4.8	±	3.0	23.3	±	16.2
Amphipoda	6.5	±	3.9	7.5	±	1.6	8.4	±	8.0
Salps	1.4	±	0.4	11.7	±	6.6	0.1	±	0.2
Decapods	7.8	±	4.5	0.0	±	0.0	0.0	±	0.0
Ctenophora	0.9	±	0.5	0.0	±	0.0	3.7	±	2.1
Siphonophores	2.2	±	1.1	0.0	±	0.1	1.6	±	0.6
Platyhelminthes	0.0	±	0.0	0.0	±	0.0	1.9	±	1.1
Foraminifera	0.3	±	0.2	0.2	±	0.1	0.8	±	2.7
Radiolaria	0.0	±	0.0	0.1	±	0.1	1.2	±	0.6
Gastropoda	0.1	±	0.0	0.1	±	0.0	0.8	±	0.6
Nauplius_L	0.0	±	0.1	0.1	±	0.0	0.6	±	0.7
Cirripedia_L	0.0	±	0.0	0.0	±	0.0	0.5	±	0.1
Pteropoda	0.0	±	0.0	0.0	±	0.0	0.0	±	0.0
Appendicularia	0.0	±	0.0	0.0	±	0.0	0.0	±	0.0
Fish_Egg	0.0	±	0.0	0.0	±	0.0	0.0	±	0.0
Echinoderm_L	0.0	±	0.0	0.0	±	0.0	0.0	±	0.0
Bryozoa	0.0	±	0.0	0.0	±	0.0	0.0	±	0.0