The following supplement accompanies the article

Diet of sardine *Sardina pilchardus*: an 'end-to-end' field study

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Summary. Detailed information on the diet of juvenile and adult sardines in the North Aegean Sea. The taxa that differentiate the diet between juveniles and adults or between summer and winter are also provided. Finally, the main copepod and cladoceran taxa in the field-collected mesozooplankton samples in each sampling period are shown

Table S1. Identified prey in the stomachs of sardine and equations used for conversion of size to (DW) dry weight and (C) carbon content. Individuals belonging to the genera *Clausocalanus* and *Paracalanus* and the species *Ctenocalanus vanus* were classified as the 'Clauso-Paracalanidae' group. TL: Maximum dimension of prey (µm). V: Volume (μm^3). TrL: Trunk length. BL: Body length without spine. PL: Prosome length. CL: Carapace length

Group	Taxon	TL ± SD	Size (indicated in parenthesis) used for conversion to C	Equations used to convert size to DW	Equations used to convert size or DW to C
Appendicularians	Appendicularians	1681 ± 158	304 ± 60 (TrL)		$C = 7.33 \times 10^{-8} \times (TrL)^{2.63}$ (a)
Bivalves	Lamellibranchia larvae	337 ± 60	337 ± 60 (TL)		$C = 3.06 \times 10^{-8} \times (TL)^{2.88}$ (b)
Ciliates (order Tintinnida)	*Eutintinnus tubulosus*	110 ± 10	37 699 (V)(j)		$C = 445.5 + 0.053V$ (c)
Cirripedes	Cirripedes nauplii	578 ± 95	578 ± 95 (BL)	$DW = 80.627 \times TL^{4.27}$ (d)	$C = 0.424 \times DW$ (e)
Cladocerans	*Evadne spinifera*	565 ± 45	565 ± 45 (TL)	$DW = 3.946 \times (TL \times 10^{-3})^{2.436}$ (d)	$C = 0.424 \times DW$ (e)
	Penilia avirostris	576 ± 58	576 ± 58 (TL)		$\log_{10}(C) = 4.51 \times \log(TL \times 10^{-3}) - 12.74$ (f)
	Podon intermedius	675 ± 81	675 ± 81 (TL)		$\log_{10}(C) = 3.46 \times \log(TL \times 10^{-3}) - 9.34$ (f)
	Pseudoevadne tergestina	515 ± 14	515 ± 14 (TL)	$DW = 3.946 \times (TL \times 10^{-3})^{2.436}$ (d)	$C = 0.424 \times DW$ (e)
Copepods	*Acartia clausi*	911 ± 191	645 ± 143 (PL)	$\log(DW) = 4.088 \times \log(PL \times 10^3) - 11.174$ (g)	$C = 0.424 \times DW$ (e)
	Calanus spp.	1356 ± 336	1136 ± 90 (PL)	$\log(DW) = 2.69 \times \log(PL \times 10^3) - 6.883$ (h)	$C = 0.424 \times DW$ (e)
	Calocalanus spp.	572 ± 71	424 ± 25 (PL)	$\log(DW) = 2.738 \times \log(PL \times 10^3) - 6.934$ (i)	$C = 0.424 \times DW$ (e)
	Candacia spp.	1598 ± 108	1160 ± 39 (PL)	$\log(DW) = 2.451 \times \log(PL \times 10^3) - 6.103$ (i)	$C = 0.424 \times DW$ (e)
	Centropages spp.	1163 ± 232	809 ± 158 (PL)	$\log(DW) = 2.451 \times \log(PL \times 10^3) - 6.103$ (i)	$C = 0.424 \times DW$ (e)
	Clauso-Paracalanidae	721 ± 135	526 ± 93 (PL)	$\ln(DW) = 2.74 \times \ln(PL \times 10^3) - 16.41$ (h)	$C = 0.424 \times DW$ (e)
	Clytemnestra spp.	759 ± 86	549 ± 94 (PL)	$\ln(DW) = 1.96 \times \ln(PL \times 10^3) - 11.64$ (j)	$C = 0.424 \times DW$ (e)

	Copepod nauplii	177 ± 28	177 ± 28 (PL)	$\log(DW) = 2.848 \times \log(TL \times 10^3) - 7.265$ [k]	$C = 0.424 \times DW$ [e]
	Corycaeidae	894 ± 214	582 ± 165 (PL)	$\ln(DW) = 1.96 \times \ln(PL \times 10^3) - 11.64$ [j]	$C = 0.424 \times DW$ [e]
	Euchaeta spp.	1810 ± 84	1462 ± 42 (PL)		$\log_{10}(C) = 2.45 \times \log(TL \times 10^3) - 6.25$ [f]
	Euterpina acutifrons	559 ± 78	387 ± 65 (PL)	$\ln(DW) = 1.96 \times \ln(PL \times 10^3) - 11.64$ [j]	$C = 0.424 \times DW$ [e]
	Harpacticoids	499 ± 193	330 ± 115 (PL)	$\ln(DW) = 1.96 \times \ln(PL \times 10^3) - 11.64$ [j]	$C = 0.424 \times DW$ [e]
	Microsetella rosea	655 ± 186	461 ± 113 (PL)	$\ln(DW) = 1.96 \times \ln(PL \times 10^3) - 11.64$ [h]	$C = 0.424 \times DW$ [e]
	Oithona spp.	516 ± 140	312 ± 77 (PL)	$\ln(DW) = 1.96 \times \ln(PL \times 10^3) - 11.64$ [j]	$C = 0.424 \times DW$ [e]
	Oncaea spp.	514 ± 99	318 ± 71 (PL)	$\ln(DW) = 1.96 \times \ln(PL \times 10^3) - 11.64$ [j]	$C = 0.424 \times DW$ [e]
	Pontellidae	1800 ± 230	1370 ± 90 (PL)	$DW = 3.77 \times 10^{-8} \times PL^{2.637}$ [l]	$C = 0.424 \times DW$ [e]
	Temora stylifera	963 ± 230	642 ± 153 (PL)	$\log(DW) = 2.710 \times \log(TL \times 10^3) - 3.685$ [l]	$C = 0.424 \times DW$ [e]
Decapods	Crab (zoea)	1500 ± 248	932 ± 147 (CL)		$C = (4.01 \times 10^{-12}) \times CL^{4.33}$ [m]
	Shrimp (mysids)	2069 ± 204	1475 ± 283 (CL)		$C = (4.01 \times 10^{-12}) \times CL^{4.33}$ [m]
Gastropods	Gastropod larvae	471 ± 27	471 ± 27 (TL)		$C = 2.31 \times 10^{-5} \times TL^{2.05}$ [n]
	Pteropods	750 ± 58	750 ± 58 (TL)		$C = 3.06 \times 10^{-8} \times (TL)^{2.88}$ [b]
Dinoflagellates (heterotrophic)	*Protoperidinium* spp.	80 ± 10	89 730 (V)		$C = 0.288 \times V^{0.939}$ [o]
Dinoflagellates (autotrophic)	*Neoceratium* spp.	300 ± 50	44 300 (V)		$C = 0.288 \times V^{0.939}$ [o]
	Dinophysis spp.	90 ± 5	120 139 (V)		$C = 0.288 \times V^{0.939}$ [o]
	Ornithocercus spp.	88 ± 5	130 125 (V)		$C = 0.288 \times V^{0.939}$ [o]
	Prorocentrum spp.	42 ± 2	12 953 (V)		$C = 0.288 \times V^{0.939}$ [o]
Diatoms	*Asteriollenopsis* spp.	81 ± 4	1492 (V)		$C = 0.288 \times V^{0.811}$ [o]
	Bacteriastrum spp.	84 ± 3	7542 (V)		$C = 0.288 \times V^{0.811}$ [o]
	Chaetocerus spp.	64 ± 3	8120 (V)		$C = 0.288 \times V^{0.811}$ [o]
	Coscinodiscus spp.	142 ± 19	71 227 (V)		$C = 0.288 \times V^{0.811}$ [o]
	Guinardia spp.	140 ± 15	17 880 (V)		$C = 0.288 \times V^{0.811}$ [o]
	Hemiaulus spp.	86 ± 4	21 205 (V)		$C = 0.288 \times V^{0.811}$ [o]
	Navicula spp.	93 ± 4	5944 (V)		$C = 0.288 \times V^{0.811}$ [o]
	Plagiotropis spp.	116 ± 11	6250 (V)		$C = 0.288 \times V^{0.811}$ [o]
	Pleurosigma spp.	141 ± 13	7524 (V)		$C = 0.288 \times V^{0.811}$ [o]
	Pleurosira spp.	45 ± 4	10 995 (V)		$C = 0.288 \times V^{0.811}$ [o]
	Pseudo-nitzschia spp.	63 ± 3	1165 (V)		$C = 0.288 \times V^{0.811}$ [o]
	Rhizosolenia spp.	762 ± 132	268 375 (V)		$C = 0.288 \times V^{0.811}$ [o]
	Thalassiosira spp.	38 ± 8	10 828 (V)		$C = 0.288 \times V^{0.811}$ [o]

[a]King 1980; [b]Fotel et al. 1999; [c]Verity & Langdon 1984; [d]James 1987; [e]van der Lingen 1998; [f]Uye & Kasahara 1983; [g]Christou & Verriopoulos 1993; [h]Chisholm & Roff 1990; [i]Hay et al. 1991; [j]van der Lingen 2002; [k]Durbin & Durbin 1978; [l]Ara 2001; [m]Hirota & Fukuda 1985; [n]Hansen & Ockelmann 1991; [o]Menden-Deuer & Lessard 2000

Table S2. Contribution based on numbers ($\%_n$) and carbon content ($\%_C$) of prey to sardine diet

Category	Taxon	July 2007		July 2007		December 2007		July 2008		July 2008		February 2009	
		Juveniles		Adults		Adults		Juveniles		Adults		Adults	
		$\%_n$	$\%_C$	$\%_n$	$\%_C$	$\%_n$	$\%_C$	$\%_n$	$\%_C$	$\%_n$	$\%_C$	$\%_n$	$\%_C$
Appendicularians	Appendicularians	0.92	0.25	0.21	0.24			7.07	2.37	3.77	3.25		
Bivalves	Lamellibranchia larvae	1.06	0.67	0.73	1.94			1.30	1.03	0.17	0.34		
Ciliates (order Tintinnida)	*Eutintinnus tubulosus*			9.28	0.14	2.69	0.03			4.37	0.05	7.21	0.11
Cirripedes	Cirripedes nauplii	1.15	5.16	0.11	2.17			0.34	1.90	0.37	5.36	0.04	0.75
Cladocerans	*Evadne spinifera*									0.35	0.57	0.01	0.02
	Penilia avirostris	0.07	0.04	0.02	0.05			2.68	1.86	1.99	3.55		
	Podon intermedius	3.32	3.76	0.32	1.54	0. 3	1.08	3.01	4.26	1.09	3.96	0.53	2.08
	Pseudoevadne tergestina	0.33	0.11							1.86	2.00		
	Unidentified cladoceran	0.07	0.04	0.09	0.90			2.30	1.57				
Copepods	*Acartia clausi*	17.72	12.64	2.19	8.61	0.14	0.36	9.43	11.09	0.97	2.94	0.30	1.21
	Calanus spp.					0.33	9.09	0.33	4.09	0.04	1.27	0.09	3.38
	Calocalanus spp.							0.20	0.21	0.13	0.35		
	Candacia spp.					0.03	1.13					0.01	0.29
	Centropages spp.	4.06	17.71	0.48	9.45	5.92	74.52	1.28	7.76	0.51	7.63	3.69	76.8
	Clauso-Paracalanidae	9.86	9.67	2.70	10.16	0.43	1.15	4.4	5.38	1.78	5.57	2.32	8.76
	Clytemnestra spp.	0.07	0.06					1.17	1.38	0.64	1.96		
	Copepod nauplii	2.75	0.26	0.72	0.29	0.05	0.01	7.23	0.86	2.34	0.71	0.05	0.02
	Corycaeidae	1.00	1.06	0.67	3.03	0.05	0.15	2.8	3.71	1.08	3.66	0.24	1.08
	Euchaeta spp.					0.02	2.11						
	Euterpina acutifrons	14.22	5.78	1.18	2.37	0.05	0.06	10.95	6.53	3.55	5.44	0.05	0.11
	Harpacticoids	0.51	0.18	0.36	0.54	0.02	0.02	0.85	0.37	0.04	0.04		
	Microsetella rosea	1.12	0.75	0.16	0.45	0.03	0.06	1.73	1.46	1.51	3.25	0.08	0.24
	Oithona spp.	2.77	0.86	0.76	1.00	0.17	0.15	2.3	0.9	0.46	0.46	0.05	0.06
	Oncaea spp.	12.92	4.19	1.39	1.91	0.22	0.2	23.25	8.99	6.94	7.23	0.86	1.20
	Pontellidae					0.03	0.23						
	Temora stylifera	10.06	25.12	3.39	37.71	0.79	5.9	10.2	31.00	3.94	32.13		
	Unidentified copepod	9.39	9.02	1.53	2.51	0.27	3.2	3.02	2.52	1.01	2.31	0.14	2.34
Decapods	Crab (zoea)	0.01	0.24		0.35				0.18		0.26		0.08
	Shrimp (mysids)	0.01	1.86		3.98				0.78		2.65		0.55
Gastropods	Gastropod larvae	0.07	0.54	0.23	7.50								
	Pteropods			0.03	2.27					0.04	2.49		
Dinoflagellates (Heterotrophic)	*Protoperidinium* spp.	3.78	0.02	14.6	0.31	6.00	0.08	1.24	0.01	14.44	0.23	10.6	0.23
Dinoflagellates (Autotrophic)	*Neoceratium* spp.	2.76	0.01	5.19	0.04	10.26	0.05	1.19	0.01	9.44	0.06	9.15	0.08
	Dinophysis spp.			2.52	0.02	2.47	0.01			0.47			
	Ornithocercus spp.			2.52	0.02	3.17	0.02			2.43	0.02		
	Prorocentrum spp.			8.26	0.03	5.80	0.01			3.73	0.01	6.45	0.02
Diatoms	*Asteriollenopsis* spp.			1.44									

Bacteriastrum spp.			2.66	0.03			0.94	0.01		
Chaetocerus spp.			16.09	0.01			1.12		14.95	0.02
Coscinodiscus spp.	5.32	0.08	6.00	0.06	1.73	0.01	8.51	0.09	4.54	0.07
Guinardia spp.	13.45	0.27	2.35	0.03			8.09	0.12	11.92	0.24
Hemiaulus spp.	1.44	0.01	3.57	0.01			4.49	0.01		
Navicula spp.	1.44									
Plagiotropis spp.	1.36						0.94			
Pleurosigma spp.			1.67	0.01			1.25	0.01		
Pleurosira spp.	5.26						0.47			
Pseudo-nitzschia spp.	3.96		17.52	0.02			2.72		11.34	0.01
Rhizosolenia spp.	6.69	0.11	4.10	0.04			1.12	0.01	15.38	0.25
Thalassiosira spp.			6.80	0.01			0.89			

Table S3. Taxa detected by SIMPER as distinguishing the diet of juvenile and adult sardines in both summer periods considered and the contributions (%) of each taxon to the dissimilarity between the compositions in each ontogenetic group. High (>1.5) ratios of dissimilarity to standard deviation (Diss:SD) in **bold**. Cum.% = cumulative contributions in %

Species	Juveniles	Adults	Diss:SD	Contribution (%)	Cum.%
	Mean abundance (no. of individuals)	Mean abundance (no. of individuals)			
Protoperidinium spp.	4.85	136.51	**3.09**	13.03	13.03
Guinardia spp.	0.00	87.27	**1.96**	9.33	22.37
Ceratium spp.	4.03	80.51	**1.59**	7.31	29.68
Coscinodiscus spp.	2.91	73.89	**1.84**	6.44	36.12
Oncaea spp.	48.69	54.28	1.23	5.98	42.10
Eutintinus tubulosus	0.00	51.19	**2.00**	5.90	48.00
Prorocentrum spp.	0.00	44.39	1.07	5.36	53.36
Euterpina acutifrons	28.87	28.73	1.42	3.32	56.68
Temora stylifera	24.57	36.06	1.22	3.07	59.76
Acartia clausi	28.87	11.66	0.89	2.87	62.63
Rhizosolenia spp.	0.00	21.88	0.65	2.86	65.49
Appendicularians	12.60	28.39	0.84	2.75	68.24
Hemiaulus spp.	0.00	36.21	1.03	2.75	70.99
Pleurosira spp.	0.00	14.16	0.77	2.65	73.64
Nitzschia spp.	0.00	28.17	0.91	2.63	76.27
Ornithocercus spp.	0.00	23.10	0.76	2.15	78.42
Copepod nauplii	14.21	18.84	1.17	1.99	80.41
Para-Clauso-Cteno	14.65	18.63	1.14	1.82	82.22
Bacillaria spp.	0.00	21.89	0.79	1.68	83.91
Plagiotropis spp.	0.00	9.75	0.44	1.27	85.18
Penilia avirostris	4.58	14.82	1.07	1.24	86.41
Dinophysis spp.	0.00	8.61	0.55	1.22	87.63
Podon intermedius	7.50	8.73	1.03	1.00	89.78
Pseudoevadne tergestina	0.24	13.80	0.88	0.96	90.74

Table S4. Taxa detected by SIMPER as distinguishing the diet of adult sardines between summer and winter and the contribution (%) of each taxon to the dissimilarity between the compositions in each season. High (>1.5) ratios of dissimilarity to standard deviation (Diss:SD) in **bold**. Cum.% = cumulative contributions in %

Species	Summer	Winter	Diss:SD	Contribution (%)	Cum.%
	Mean abundance (no. of individuals)	Mean abundance (no. of individuals)			
Chaetocerus spp.	8.32	311.64	**3.24**	16.25	16.25
Nitzschia spp.	28.17	280.20	**2.20**	13.07	29.32
Rhizosolenia spp.	21.88	170.08	1.32	8.58	37.89
Ceratium spp.	80.51	193.94	1.44	7.15	45.04
Guinardia spp.	87.27	121.96	1.15	4.79	49.83
Centropages spp.	4.75	99.27	0.99	4.73	54.56
Protoperidinium spp.	136.51	154.94	1.41	4.73	59.29
Prorocentrum psp.	44.39	119.69	**1.52**	4.49	63.77
Thalassiosira spp.	6.58	80.61	0.80	3.79	67.56
Tintinnids	51.19	88.77	1.19	3.76	71.32
Coscinodiscus spp.	73.89	107.01	**1.60**	3.67	74.99
Hemiaulus spp.	36.21	42.36	1.18	2.38	77.37
Oncaea spp.	54.28	9.40	0.96	2.22	79.59
Ornithocercus spp.	23.10	37.63	1.16	1.97	81.56
Temora stylifera	36.06	9.42	1.26	1.57	83.13
Bacteriastrum spp.	6.99	31.60	0.97	1.56	84.69
Dinophysis spp.	8.61	29.32	1.03	1.46	86.15
Euterpina acutifrons	28.73	0.98	1.08	1.25	87.41
Para-Clauso	18.63	23.34	0.76	1.21	88.62
Appendicularians	28.39	0.00	0.62	1.18	89.80
Pleurosigma spp.	9.25	19.81	0.94	1.11	90.91

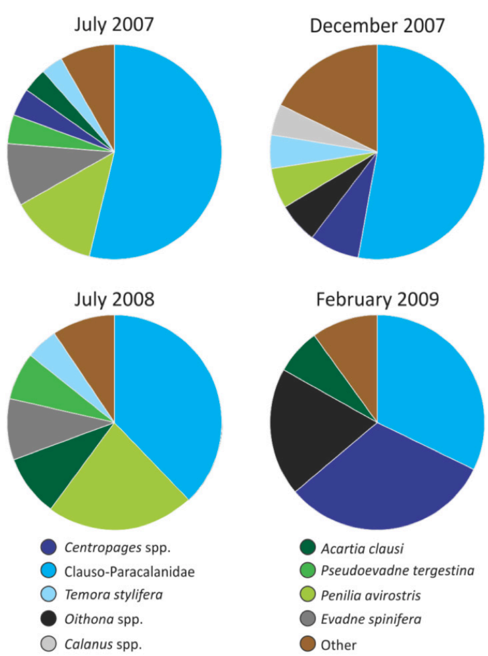

Fig. S1. Field collected mesozooplankton samples. Numerical contribution (%) of copepods and cladocerans in each sampling period. The taxonomic resolution is the same as in the stomach content analysis

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