

Trophic ecology of pelagic fish species off the Iberian coast: diet overlap, cannibalism and intraguild predation

S. Garrido*, A. Silva, J. Pastor, R. Dominguez, A. V. Silva, A. M. Santos

*Corresponding author: garridosus@gmail.com

Marine Ecology Progress Series 539: 271–286 (2015)

Supplement.

Table S1. Mean prey number (N) of each prey species/groups identified in pelagic fish stomachs collected during the PELAGO14 research cruise. Data are divided per area (West and South Iberian coasts), species, which are presented as FAO codes (pil: *Sardina pilchardus*, ane: *Engraulis encrasicolus*, mas: *Scomber colias*, hom: *Trachurus trachurus*, bog: *Boops boops*, mac: *Scomber scombrus*, jaa: *Trachurus picturatus*, hmm: *Trachurus mediterraneus* and maturity stages (ad: Adults and juv: Juveniles).

Species area maturity	N																					
	pil				ane				mas				hom				mac		bog		jaa	hmm
	south		west		south		west		south		west		south		west		west		west	south		
	juv	ad	juv	ad	juv	ad	juv	ad	juv	ad	juv	ad	juv	ad	juv	ad	juv	ad	juv	ad		
Phytoplankton	67	2																				
Phytoplankton n.i.	27	123	21	245					6		5	1						5				
Dinoflagellate n.i.	28	4123	10	167485	1				54	13	2221	1472			13	1200		317	87			
<i>Ceratium</i> spp.		7		38				2										5				
<i>Dinophysis acuta</i>	5	12	15	1284				2		13	2	10			5				22			
<i>Dinophysis caudata</i>	32	24	17	494				1	3		35							5				
<i>Dinophysis acuminata</i>	5	5		3							3								4			
<i>Dinophysis rotundata</i>		9		6							5								4			
<i>Triadinium poliedricum</i>		3	6																			
<i>Pyrocystis lunula</i>		2						1			5				6			13				
<i>Prorocentrum micans</i>	76	298	22	1514							45	13			13	150		11				
<i>Protopteridinium</i> spp.	32	99	2	29					3													
<i>Protopteridinium diabolum</i>		2																				
<i>Protopteridinium oceanicum</i>	17																					

N

Species area maturity	pil				ane				mas				hom				mac		bog		jaa	hmm
	south		west		south		west		south		west		south		west		west	south	west	west	south	
	juv	ad	juv	ad	juv	ad	juv	ad	juv	ad	juv	ad	juv	ad	juv	ad	juv	ad	ad	ad	juv	ad
<i>Noctiluca scintillans</i>	17																					
<i>Scropsiella</i> spp.	226	80	170	524	173	838	75		44	10	47	41				30	50	12	26			
Dinoflagellate cyst	8			3																		
Pennate diatom n.i.		15	29	50			20		6									4	5			
<i>Coscinodiscus</i> spp.				3																		
<i>Diploneis</i> spp.									6		10	7										
<i>Navicula</i> spp.	251949		40																			
<i>Paralia sulcata</i>	33				1																	
<i>Pleurosigma/Gyrosigma</i> spp.	19	10	50				1				14							13	17			
<i>Thalassiosira</i> spp.	4																					
<i>Odontella</i> spp.				13																		
Silicoflagellate n.i.				38																		
<i>Dictyocha speculum</i>																						
Zooplankton																						
Crustacean n.i.	1	2	5	6	1		0		1		1	2			3	1			2	0	0	
Crustacean eggs	16	18	1	521	1	4	19		3	2	2	10	1			0		5	2			
Crustacean nauplii			0	7							2	2										
Copepod eggs	305	526	156	2354	225	162	434	282	216	48	462	628				190	4250	539	292			
Copepod egg sac	1				4	1										8						
Copepod nauplii	8	6	1	22	0	0	2					0						5				
Copepod n.i.	10	35	136	235	25	22	22	56	77	20	48	63	2	1	12	16	83	39	18	13	6	14
<i>Euterpina acutifrons</i>	18	9	13	80	25	27	3	6	5	3	27	12	2	0	4	0	1	154	9	1		
<i>Microsetella</i> spp.	0	3		6	0	1	1					1				0	0		1			
<i>Oncaea</i> spp.	39	19	25	64	59	22	1	2	13	2	5	9				0			1		0	
<i>Oithona</i> spp.	1		2	25															1			
<i>Corycaeus</i> spp.		4	6	9	1	19	1	17	2	1	7	5	1	0	2	1	1		2		0	
Cal/Paracal/Clausocal	11	4	53	88	3	5	7	26	40	2	36	38			3	1	53	616	12	5	1	0
<i>Calanus helgolandicus</i>	3	75	7	28	29	18		22	56	17	14	53			6	4	14		33	7	3	4
<i>Calanus carinatus</i>		3	2	9		0		0	15	1	5	3			0	3	2		4	2	1	0
<i>Eucalanus</i> spp.								0														
<i>Euchaeta</i> spp.		0	1		0	0			3			3					0		2			0
<i>Temora</i> spp																				0		

N

Species area maturity	pil				ane				mas				hom				mac		bog		jaa	hmm
	south		west		south		west		south		west		south		west		west	south	west	west	south	
	juv	ad	juv	ad	juv	ad	juv	ad	juv	ad	juv	ad	juv	ad	juv	ad	juv	ad	ad	ad	juv	ad
<i>Temora stylifera</i>		0	11	28	1			4	1		1	3	1	0	1			2		1		
<i>Temora longicornis</i>	0	4	19	78	4	14	46	58	4	2	30	20	1	84	2	305	2657	3	2	1		
<i>Centropages</i> spp.																0						
<i>Centropages chierchiae</i>	1	4	250	268	0	5	3	411	9	5	125	877	1	279	50	647	3042	9	29	1	4	
<i>Candacia</i> spp.		3	3	3		11		3		4	1	33		1	0	0		3	2	4	0	
<i>Acartia</i> spp.		1	13	44	1	2	2	18	44	68	39	42		2	0	61	963	1	4			
<i>Pleurommama</i> spp.			0	0				0						0	0							0
<i>Cirripedia</i>	7	3	10	43	0	3		7	3	3	4	5		0	4	0	18	154	4	1		
Cladocera																						
<i>Podon</i> spp.						0	2					1								1		
<i>Penilia</i> spp.				0								1										
Decapoda	1	1	1	1		1		1	1	1		2		2	0	9			4	1		
Brachiura zoe			0			0		0	2		1	2				7		1	1			
Caridea	1					0						3										
Euphasiacea					1	2	3	1				5		0	0	1						
Misidacea						1	1															
Amphipoda												1			0						0	
Lamelibranchia veligera							1	3							0	0					0	
Gastropoda		1		13	0	3									0	0					1	
Pteropoda								0							0							0
Tintinnoinea	5		15	14				2												3		
Polichaeta																1						
Appendicularia	1					0													1			
Foraminifera							11															
<i>Globigerina boloides</i>			1	3																		
Ichthyoplankton																						
Fish eggs	5	21	6	43	0	58		1	12	17	1	10	1		0		39	24	6			
Anchovy eggs	364	0		3						1										6		0
Sardine eggs	5	50	30	15		0		1	47	4	35	7	1		0			41	1			
Total number prey	1342	257599	1109	233437	380	560	1375	1045	671	235	3239	3385	9	2	402	81	1467	13312	1108	548	20	24
N	22	64	46	19	18	59	19	102	22	14	18	29	2	5	28	34	5	1	24	28	5	10

Table S2. Relative contribution to total dietary carbon (%C) of prey species/groups identified in pelagic fish stomachs collected during the PELAGO14 research cruise. Data are divided per area (West and South Iberian coasts), species and maturity stages (ad: Adults and juv: Juveniles). Species are presented as FAO codes as described in Table S1. Prey species/groups contributing with >5% to total dietary carbon are highlighted.

		%C																					
Species	Area	pil				ane				mas				hom				mac		bog		jaa	hmm
		south		west		south		west		south		west		south		west		west	south	west	west	south	
		juv	ad	juv	ad	juv	ad	juv	ad	juv	ad	juv	ad	juv	ad	juv	ad	juv	ad	ad	ad	juv	ad
Phytoplankton																							
	Phytoplankton n.i.	0.03	0.00		0.00																		
	Dinoflagellate n.i.	0.00	0.05	0.00	0.05					0.00		0.00	0.00							0.00			
	Ceratium spp.	0.00	4.42	0.00	4.42		0.00			0.00	0.00	0.58	0.59					0.03		0.10	0.01		
	<i>Dinophysis acuta</i>		0.00		0.00				0.00											0.00			
	<i>Dinophysis caudata</i>	0.00	0.01	0.00	0.01				0.00		0.00	0.00	0.00								0.00		
	<i>Dinophysis acuminata</i>	0.03	0.01	0.00	0.01				0.00		0.00									0.00			
	<i>Dinophysis rotundata</i>	0.00	0.00		0.00							0.00									0.00		
	<i>Triadinium poliedricum</i>		0.01	0.01								0.00									0.00		
	<i>Pyrocystis lunula</i>		0.00		0.00																		
	<i>Prorocentrum micans</i>		0.00		0.00				0.00			0.00								0.00			
	Protoperidinium spp.	0.02	0.74	0.02	0.74							0.03	0.01					0.01		0.01			
	<i>Protoperidinium diabolum</i>	0.00	0.05	0.00	0.05				0.00														
	<i>Protoperidinium oceanicum</i>		0.00		0.00																		
	<i>Noctiluca scintillans</i>	0.00																					
	Scropsiella spp.	0.01																					
	Dinoflagellate cyst	1.12	0.19	0.06	0.19		0.10	1.66	2.20	0.00	0.00	0.02	0.01					0.04	0.00	0.00	0.02		
	Pennate diatom n.i.			0.00																			
	Coscinodiscus spp		0.00	0.00	0.00				0.00											0.00	0.00		
	Diploneis spp.																						
	Navicula spp.								0.00		0.00	0.00											
	<i>Paralia sulcata</i>		1.52	0.00	1.52																		
	Pleurosigma/Gyrosigma spp.		0.01		0.01		0.00																
	Thalassiosira spp.		0.00	0.00	0.00			0.00			0.00									0.00	0.00		
	Odontella spp.		0.00		0.00																		
	Silicoflagellate n.i.																						
	<i>Dictyocha speculum</i>																						

		%C																						
Species	Area	pil				ane				mas				hom				mac		bog		jaa	hmm	
		south		west		south		west		south		west		south		west		west	south	west	west	south		
		juv	ad	juv	ad	juv	ad	juv	ad	juv	ad	juv	ad	juv	ad	juv	ad	juv	ad	ad	ad	juv	ad	
Zooplankton																								
	Crustacean n.i.	0.30	0.21	0.10	0.21		0.13		0.00	0.01		0.02	0.20			0.25	0.09				0.10	0.89	0.07	
	Crustacean eggs	0.01	0.04	0.00	0.04	0.01	0.00		0.00	0.00	0.00	0.01		0.01			0.00		0.00	0.00				
	Crustacean nauplii			0.02									0.05	0.23										
	Copepod eggs	0.98	0.47	0.07	0.47	1.32	0.18	0.90	0.14	0.04	0.01	0.18	0.15				0.15		0.17	0.07				
	Copepod egg sac	0.00				0.01	0.00										0.01							
	Copepod nauplii	0.01	2.97	0.01	2.97	0.02	0.01		0.00			0.04								0.00				
	Copepod n.i.	1.68	6.09	9.86	6.09	14.69	5.37	11.89	2.78	3.53	1.54	3.40	6.40	7.58	35.17	7.21	15.67	6.17	0.30	1.93	1.12	2.54	45.22	
	<i>Euterpina acutifrons</i>	0.59	0.61	0.33	0.61	5.07	2.88	0.42	0.08	0.20	0.05	0.55	0.40	1.52	2.08	0.12	0.01	0.06	0.27	0.20	0.01			
	<i>Microsetella</i> spp.	0.41	0.59		0.59	0.05	0.37		0.02				0.12				0.03			0.08				
	<i>Oncaea</i> spp.	8.48	2.05	0.71	2.05	6.64	0.94	0.05	0.02	0.12	0.02	0.11	0.20				0.03			0.01			0.03	
	<i>Oithona</i> spp.	0.00		0.09																0.02				
	<i>Corycaeus</i> spp.		0.43	0.24	0.43	0.31	4.09	0.14	0.61	0.02	0.00	0.46	0.16	1.53	3.67	0.17	0.10			0.09		0.07		
	Cal/Paracal/Clausocal	1.15	1.29	5.00	1.29	0.31	0.92	3.02	1.76	1.52	0.15	2.70	4.22				0.97	0.31	0.60	3.35	1.21	0.74	0.53	0.26
	<i>Calanus helgolandicus</i>	11.50	26.19	3.13	26.19	57.00	30.43		11.59	32.28	20.87	16.62	12.33				13.73	13.14		31.08	7.06	14.81	37.56	
	<i>Calanus carinatus</i>		4.27	0.16	4.27		0.49		0.63	2.80	1.28	2.48	0.19			1.04	8.80			4.59	2.64	5.22	1.63	
	<i>Eucalanus</i> spp.								0.10															
	<i>Euchaeta</i> spp.		0.07	0.87	0.07	3.00	0.27			0.55			0.16							2.51			2.12	
	<i>Temora</i> spp																				0.19			
	<i>Temora stylifera</i>		0.11	1.26	0.11	1.66			0.35	0.05		0.21	0.65	3.28		0.31	0.28			0.48		0.74		
	<i>Temora longicornis</i>	0.76	0.69	2.82	0.69	0.63	6.03	24.93	6.25	0.20	0.17	4.50	2.08	8.63		6.60	0.41	12.00	17.00	0.45	0.20	0.37		
	<i>Centropages</i> spp.																							
	<i>Centropages chierchiaie</i>	0.09	3.77	44.18	3.77	2.63	2.77	3.14	66.43	1.13	0.74	36.38	41.25	14.44		47.79	44.18	80.43	65.35	3.58	6.49	0.95	9.84	
	<i>Candacia</i> spp.		1.98	2.49	1.98		8.23		0.75		4.13	0.65	1.48			4.88	0.59			2.30	2.64	14.15	0.85	
	<i>Acartia</i> spp.		0.33	1.24	0.33	1.43	0.81	1.15	1.88	0.93	6.87	3.48	4.46			0.96	0.39	0.70	8.75	0.02	0.42			
	<i>Pleurommama</i> spp.			0.70					0.14							0.87	0.13						1.43	
	Cirripedia	1.80	1.30	5.60	1.30	3.44	1.37		1.52	0.02	0.25	0.34	1.00		11.88	1.02	0.00		2.88	0.42	0.00			
	Cladocera																							
	<i>Podon</i> spp.						0.01	0.14					0.06				0.02				0.02			
	<i>Penilia</i> spp.												0.05											
	Decapoda	0.67	0.20	2.25	0.20		0.25		0.69	16.49	49.89		4.73			12.25	14.28				61.70	57.11		

%C

Species Area Maturity	pil				ane				mas				hom				mac		bog		jaa	hmm
	south		west		south		west		south		west		south		west		west		south	west	west	south
	juv	ad	juv	ad	juv	ad	juv	ad	juv	ad	juv	ad	juv	ad	juv	ad	juv	ad	ad	ad	juv	ad
Brachiura zoe			0.46		0.96		0.13	0.60		0.11	1.14							0.59	0.00			
Caridea	3.36						0.29															
Euphasiacea					0.04	4.65	36.63	0.23			1.35		47.21	0.30								
Misidacea						1.44	12.53															
Amphipoda											0.09				0.04						0.21	
Lamelibranchia veligera											3.39	0.20			0.03	0.14					0.14	
Gastropoda		0.01		0.01	0.95	0.91									1.45	0.20					2.26	
Pteropoda												0.00				0.16						
Tintinnoinea	0.02		0.02									0.00								0.00		
Polichaeta																						
Appendicularia	1.32					0.27														0.11		
Foraminifera											0.02											
<i>Globigerina boloides</i>			0.00																			
Ichthyoplankton																						
Fish eggs	5.65	6.07	1.53	6.07	0.78	25.16		0.32	8.54	4.66	0.17	3.36	10.34			0.05		1.92	11.09	4.40		
Anchovy eggs	44.06	0.10		0.10						0.00											3.37	
Sardine eggs	15.93	33.13	16.77	33.13		0.67		1.18	30.95	9.36	26.98	12.38	52.67			0.90			38.96	8.80		
N	22	64	46	19	18	59	19	102	22	14	18	29	2	5	28	34	5	1	24	28	5	10