

Potential impacts of climate change and humans on the trophic network organization of estuarine food webs

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Table S1 - References used to establish feeding links

Author	Year	Title	Source
Albentosa, Perez-Camacho, Labarta, Beiras, Fernandez-Beiriz	1993	Nutritional value of algal diets to clam spat <i>Venerupis pullastra</i>	Mar Ecol Progr Ser 97:261-269
Almeida	2003	Feeding ecology of <i>Liza ramada</i> (Risso, 1810) (Pisces, Mugilidae) in a south-western estuary of Portugal	Estuar Coast Shelf Sci 57: 313–323
Almeida, Moreira, Costa, Assis, Costa	1993	The feeding strategies of <i>Liza ramada</i> (Risso, 1826) in fresh and brackish water in the River Tagus, Portugal	J Fish Biol 42: 95–107
Ambrose, Nelson	1983	Predation by <i>Octopus vulgaris</i> in the Mediterranean.	Mar Ecol 4:251-261
Angell	1986	The biology and culture of tropical oysters.	International Center for Living Aquatic Resources, Manila, 37p
Ansell	1974	Seasonal Changes in Biochemical Composition of the Bivalve <i>Abra alba</i> from the Clyde Sea Area	Mar Biol 25:13-20
Ansell, Comely, Robb	1999	Distribution, movements and diet of macrocrustaceans on a Scottish sandy beach with particular reference to predation on juvenile fishes	Mar Ecol Progr Ser 176:115-130
Arrhenius	1996	Diet composition and food selectivity of 0-group herring (<i>Clupea harengus</i> L.) and sprat (<i>Sprattus sprattus</i> (L.)) in the northern Baltic Sea	ICES J Mar Sci 53:701-712.
Atienza, Saiz, Calbet	2006	Feeding ecology of the marine cladoceran <i>Penilia avirostris</i> : natural diet, prey selectivity and daily ration	Mar Ecol Progr Ser 315:211–220
Avsar	1994	Diel diet and feeding behavior of scaldfish (<i>Arnoglossus laterna</i> , Walbaum, 1972) in the Bay of Mersin	Acta Adriat 34:89-101
Azevedo, Simas	2000	Age and growth, reproduction and diet of a sublittoral population of the rock goby <i>Gobius paganellus</i> (Teleostei, Gobiidae)	Hydrobiol 440:129-135

Baeta, Cabral, Cabral, Marques, Pardal	2006	Feeding ecology of the green crab <i>Carcinus maenas</i> , (L., 1758) in a temperate estuary, Portugal	Crustaceana 79:1181-1193
Bainbridge	1963	The food, feeding habits and distribution of the Bonga <i>Ethmalosa dorsalis</i> (Cuvier & Valenciennes).	J Cons int Explor Mer 28: 270-284.
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Bayhan, Sever, Taskavak	2008	Age, length-weight relationships and diet composition of scaldfish, <i>Arnoglossus laterna</i> (Walbaum, 1792) (Pisces: Bothidae) in Izmir Bay (Aegean Sea)	J Anim Vet Adv 7:924-929
Bell, Harmelin-Vivien	1983	Fish fauna of French Mediterranean <i>Posidonia oceanica</i> seagrass meadows. 2. Feeding habits.	Tethys 11:1-14
Ben-Tuvia, McKay	1986	Haemulidae In P.J.P. Whitehead, M.-L. Bauchot, J.-C. Hureau, J. Nielsen and E. Tortonese (eds.) Fishes of the north-eastern Atlantic and the Mediterranean.	UNESCO, Paris, p. 858-864.
Bernardéz, Freire, González-Gurriaran	2000	Feeding of the spider crab <i>Maja squinado</i> in rocky subtidal areas of the Ria de Arousa (North-West Spain)	J Mar Biol Ass UK 80:95-102
Bernardon, Vall	2004	Le mullet en Mauritanie: biologie, écologie, pêche et aménagement.	FIBA UICN PRCM Arles 1-56
Cabral	2000	Comparative feeding ecology of sympatric <i>Solea solea</i> and <i>S. senegalensis</i> , within the nursery areas of the Tagus estuary, Portugal	J Fish Biol 57:1550-1562
Cabral, Costa	2001	Abundance, feeding ecology and growth of seabass, <i>Dicentrarchus labrax</i> , within the nursery areas of the Tagus estuary.	J Mar Biol Ass UK 81:679 - 682
Cabral, Lopes, Loeper	2002	Trophic niche overlap between flatfishes in a nursery area in the Portuguese coast	Scient Mar 66:293-300
Cabral, Ohmert	2001	Diet of juvenile meagre, <i>Argyrossomus regius</i> , within the Tagus estuary.	Cah Biol Mar 42: 289-293
Cardona	2001	Non-competitive coexistence between Mediterranean grey mullet: evidence from seasonal changes in food availability, niche breadth and trophic overlap	J Fish Biol 59:729-744

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Chaves, Horta, Chainho, Costa, Costa	2010	New additions to the feeding ecology of <i>Carcinus maenas</i> (L., 1758) in a South-western Europe estuary (Portugal)	Cah Biol Mar 51:229-238
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Choy	1986	Diet and feeding habits of the crabs <i>Liocarcinus puber</i> and <i>L. holsatus</i> (Decapoda, Brachyura, Portunidae)	Mar Ecol Progr Ser 31:87-99
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Coetzee	1986	Diet composition and breeding cycle of blacktail, <i>Diplodus sargus capensis</i> (Pisces: Sparidae), caught off St. Croix Island, Algoa Bay, South Africa.	S Afr J Zool 21:237–243
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Dias	2007	Estudo da dieta do Corvo-marinho-de-faces-brancas (<i>Phalacrocorax carbo</i> Linnaeus, 1758) no Estuário do Rio Minho (NO-Portugal)	Degree Thesis, University of Porto
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Fjøsne, Gjørseter	1996	Dietary composition and the potential of food competition between 0-group cod (<i>Gadus morhua</i> L.) and some other fish species in the littoral zone	ICES J Mar Sci 53:757-770

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França, Vinagre, Costa, Cabral	2004	Use of the coastal areas adjacent to the Douro estuary as a nursery area for pouting, <i>Trisopterus luscus</i> Linnaeus, 1758	J Appl Ichthyol 20:99-104
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Turnpenny, Bamber, Henderson	1981	Biology of the sand-smelt (<i>Atherina presbiter</i> Valenciennes) around Faley power station	J Fish Biol 18:417-427
Vafidis, Kallianiotis, Chartosia, Koukouras	2009	The Sepioidea (Cephalopoda, Mollusca) fauna of the Aegean Sea: comparison with the neighbouring seas and notes on their diet composition.	J Biol Res Thessaloniki 11: 57-71
Vega-Pérez, Liang	1992	Feeding of a pelagic chaetognath, <i>Sagitta friderici</i> Ritter-Záhony off Ubatuba region (São Paulo, Brazil)	Bol Inst Ocean S Paulo 40: 1-2

Verdiell-Cubedo, Egea-Serrano, Oliva-Paterna, Torralva	2007	Biología trófica de los juveniles del género <i>Liza</i> (Pisces: Mugilidae) en la laguna costera del Mar Menor (SE Peninsula Iberica)	Limnetica 26:67-73
Vinagre, Cabral, Costa	2008	Prey selection by flounder, <i>Platichthys flesus</i> , in the Douro estuary, Portugal	J Appl Ichthyol 24:238–243
Vinagre, França, Costa, Cabral	2005	Niche overlap between juvenile flatfishes, <i>Platichthys flesus</i> and <i>Solea solea</i> , in a southern European estuary and adjacent coastal waters	J Appl Ichthyol 21:114–120
Zupo	2001	Influence of diet on sex differentiation of <i>Hippolyte inermis</i> Leach (Decapoda: Natantia) in the field	Hydrobiologia 449:131-140

Table S2 – Comparison of food web properties: a) Connectance and Links per species (L/S) and b) node ranking for Generality (Gen), Path Length (Path) and Short-Weighted Trophic Level (SWTL), with and without humans.

a)

	Past		Present		Future	
	Humans	No humans	Humans	No humans	Humans	No humans
Connectance	0.06	0.06	0.06	0.06	0.05	0.05
L/S	5.81	5.47	6.03	5.66	6.22	5.82

b)

Rank	Past	Gen	Gen without humans	Present	Gen	Gen without humans	Future	Gen	Gen without humans
1	<i>Homo sapiens</i>	40	—	<i>Homo sapiens</i>	45	—	<i>Homo sapiens</i>	52	—
2	<i>Pomatoschistus minutus</i>	17	17	<i>Raja clavata</i>	19	19	<i>Rhizoprionodon acutus</i>	42	42
3	<i>Phalacrocorax carbo</i>	17	17	<i>Diplodus vulgaris</i>	18	18	<i>Raja clavata</i>	19	19
4	<i>Diplodus vulgaris</i>	17	17	<i>Polychaeta</i>	18	18	<i>Raja undulata</i>	17	17
5	<i>Polychaeta</i>	17	17	<i>Raja undulata</i>	17	17	<i>Pomatoschistus minutus</i>	17	17
6	<i>Raja undulata</i>	16	16	<i>Pomatoschistus minutus</i>	17	17	<i>Phalacrocorax carbo</i>	17	17
7	<i>Engraulis encrasicolus</i>	15	15	<i>Phalacrocorax carbo</i>	17	17	<i>Diplodus vulgaris</i>	17	17
8	<i>Trisopterus luscus</i>	15	15	<i>Engraulis encrasicolus</i>	15	15	<i>Polychaeta</i>	17	17
9	<i>Platichthys flesus</i>	14	14	<i>Trisopterus luscus</i>	14	14	<i>Pseudolithus senegalensis</i>	16	16
10	<i>Ciliata mustela</i>	14	14	<i>Halobatrachus didactylus</i>	14	14	<i>Engraulis encrasicolus</i>	15	15

Rank	Past	Path	Path without humans	Present	Path	Path without humans	Future	Path	Path without humans
1	Polychaeta	1.40	1.41	Polychaeta	1.41	1.42	Polychaeta	1.43	1.45
2	Bivalvia	1.50	1.52	Bivalvia	1.50	1.52	Bivalvia	1.52	1.54
3	Amphipoda	1.62	1.52	Amphipoda	1.62	1.53	Amphipoda	1.64	1.57
4	Gastropoda	1.74	1.78	Gastropoda	1.73	1.75	<i>Homo sapiens</i>	1.69	—
5	Copepoda	1.79	1.72	<i>Homo sapiens</i>	1.76	—	Gastropoda	1.72	1.74
6	Crangonidae	1.80	1.74	Crangonidae	1.79	1.74	Copepoda	1.78	1.72
7	<i>Homo sapiens</i>	1.81	—	Copepoda	1.80	1.74	<i>Rhizoprionodon acutus</i>	1.80	1.79
8	<i>Carcinus maenas</i>	1.88	1.82	<i>Pomatoschistus minutus</i>	1.89	1.82	Crangonidae	1.80	1.75
9	<i>Pomatoschistus minutus</i>	1.91	1.84	<i>Carcinus maenas</i>	1.89	1.83	<i>Carcinus maenas</i>	1.89	1.85
10	Palaemonidae	1.91	1.87	Palaemonidae	1.91	1.86	<i>Pomatoschistus minutus</i>	1.90	1.84

Rank	Past	SWTL	SWTL without humans	Present	SWTL	SWTL without humans	Future	SWTL	SWTL without humans
1	<i>Acanthocephalus clavula</i>	4.59	4.60	<i>Acanthocephalus clavula</i>	4.62	4.63	<i>Acanthocephalus clavula</i>	4.59	4.60
2	Nematoda	4.59	4.60	Nematoda	4.62	4.63	Nematoda	4.59	4.60
3	<i>Gyrodactylus elegans</i>	4.30	4.31	<i>Gyrodactylus elegans</i>	4.32	4.33	<i>Gyrodactylus elegans</i>	4.30	4.31
4	<i>Proisorhynchus crucibulum</i>	4.30	4.31	<i>Proisorhynchus crucibulum</i>	4.32	4.33	<i>Proisorhynchus crucibulum</i>	4.30	4.31
5	Timoniella	4.30	4.31	Timoniella	4.32	4.33	Timoniella	4.30	4.31
6	<i>Proisorhynchus aculeatus</i>	4.30	4.31	<i>Proisorhynchus aculeatus</i>	4.32	4.33	<i>Proisorhynchus aculeatus</i>	4.30	4.31
7	<i>Cucullanellus minutus</i>	4.30	4.31	<i>Cucullanellus minutus</i>	4.32	4.33	<i>Cucullanellus minutus</i>	4.30	4.31
8	Hydrozoa	4.00	4.00	Hydrozoa	3.96	3.97	Hydrozoa	4.00	4.00
9	<i>Phalacrocorax carbo</i>	3.82	3.83	<i>Homo sapiens</i>	3.84	—	<i>Homo sapiens</i>	3.83	—
10	<i>Homo sapiens</i>	3.80	—	<i>Phalacrocorax carbo</i>	3.84	3.85	<i>Phalacrocorax carbo</i>	3.82	3.83