Exploring Aquatic Food Web

Supplementary Materials

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1 Data

Table 1 includes the entire dataset used in the analysis. In all, it consists of 173 graphs taken from 5 sources: the R package `igraphdata` [33], the Cohen et al. book [29], the Ecopath with Ecosim database [31], and two datasets taken directly from the papers [59, 74]

Table 1: Dataset of food webs. S is the number of compartments, L is the number of links, C is the connectance ($C = L/S^2$), and NL is the ratio of non-living compartments to total compartments.

Food web name	**Ref**	S	L	C	NL
Lower Chesapeake Bay	[33, 49]	29	115	2.19×10^{-3}	10.34%
Middle Chesapeake Bay	[33, 49]	32	149	1.44×10^{-3}	9.38%
Upper Chesapeake Bay	[33, 49]	33	158	1.32×10^{-3}	9.09%
Chesapeake Bay Mesohaline	[33, 12]	36	122	2.42×10^{-3}	8.33%
Crystal River Creek - Control	[33, 108]	21	81	3.20×10^{-3}	4.76%
Crystal River Creek - Delta Temp	[33, 108]	21	60	5.83×10^{-3}	4.76%
Charca de Maspalomas	[33, 5]	21	55	6.94×10^{-3}	14.29%
Lake Michigan	[33, 63]	34	172	1.15×10^{-3}	2.94%
Mondego Estuary - Zostrea site	[33, 89]	43	348	3.55×10^{-4}	2.33%
Narragansett Bay Model	[33, 75]	32	158	1.28×10^{-3}	3.12%
St. Marks River (Florida)	[33, 11]	51	270	7.00×10^{-4}	5.88%
Aegean Sea (2007)	[31, 62]	44	354	3.51×10^{-4}	4.55%
Albatross Bay (1986)	[31, 83]	99	1382	5.18×10^{-5}	7.07%
Aleutian Islands (1963)	[31, 46]	40	391	2.62×10^{-4}	2.50%
Alto Golfo de California	[31, 76]	29	277	3.78×10^{-4}	3.45%
Antarctic (1970)	[31, 56]	59	749	1.05×10^{-4}	1.69%
Apalachicola Bay (2000)	[31, 4]	54	622	1.40×10^{-4}	1.85%
Arctic seas	[31]	22	57	6.77×10^{-3}	4.55%
Australia North West Shelf (1986)	[31, 21]	37	370	2.70×10^{-4}	2.70%
Azores (1997)	[31, 77]	45	450	2.22×10^{-4}	2.22%
Azores archipelago (1997)	[31, 45]	44	381	3.03×10^{-4}	2.27%
Baie de Seine (2000)	[31, 50]	42	374	3.00×10^{-4}	2.38%
Bamboung (2003)	[31, 30]	31	333	2.80×10^{-4}	3.23%
Bamboung (2006)	[31, 30]	31	333	2.80×10^{-4}	3.23%

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Table 1 – continued from previous page

Food web name	Ref	S	L	C	NL
Barnegat Bay (1981)	[31, 112]	27	135	1.48×10^{-3}	3.70%
Barra Del Chuy (1992)	[31, 68]	20	77	3.37×10^{-3}	5.00%
Bay of Biscay (1970)	[31, 1]	37	499	1.49×10^{-4}	2.70%
Bay of Biscay (1980)	[31, 79]	43	382	2.95×10^{-4}	4.65%
Bay of Biscay (1994)	[31, 64]	32	223	6.43×10^{-4}	6.25%
Bay of Biscay (1998)	[31, 1]	37	492	1.53×10^{-4}	2.70%
Bay of Biscay (2013)	[31, 79]	43	383	2.93×10^{-4}	4.65%
Florida Bay - dry season	[33, 109]	125	1969	3.22×10^{-5}	2.40%
Florida Bay - wet season	[33, 109]	125	1938	3.33×10^{-5}	2.40%
Bolinao Coral Reef (1980)	[31, 3]	26	133	1.47×10^{-3}	3.85%
British Columbia coast (1950)	[31, 94]	53	513	2.01×10^{-4}	1.89%
Calvi Bay (1998)	[31, 92]	27	195	7.10×10^{-4}	3.70%
Cap de Creus MPA - whole (2008)	[31, 32]	67	768	1.14×10^{-4}	2.99%
Cape Verde (1981)	[31, 102]	31	250	4.96×10^{-4}	3.23%
Celtic Sea-Biscay (1980)	[31, 15]	38	487	1.60×10^{-4}	2.63%
Celtic Sea-Biscay (2012)	[31, 15]	38	490	1.58×10^{-4}	2.63%
Celtic Sea (1980)	[31, 79]	48	522	1.76×10^{-4}	4.17%
Celtic Sea (1985)	[31, 53]	54	760	9.35×10^{-5}	3.70%
Celtic Sea (2013)	[31, 79]	48	531	1.70×10^{-4}	4.17%
Central Atlantic (1950)	[31]	38	270	5.21×10^{-4}	2.63%
Central Atlantic (1990)	[31]	38	271	5.17×10^{-4}	2.63%
Central Baltic Sea (1974)	[31, 107]	22	114	1.69×10^{-3}	4.55%
Central Chile (1998)	[31, 80]	21	80	3.28×10^{-3}	4.76%
Central Gulf of California (1978)	[31, 10]	27	180	8.33×10^{-4}	7.41%
Cerbére-Banyuls MPA (2013)	[31, 32]	64	728	1.21×10^{-4}	3.12%
Chesapeake (1950)	[31, 28]	45	259	6.71×10^{-4}	2.22%
Contemporary Alosine (2000)	[31, 35]	59	991	6.01×10^{-5}	1.69%
Cypress Dry Season	[33, 109]	68	554	2.22×10^{-4}	4.41%
Cypress Wet Season	[33, 109]	68	545	2.29×10^{-4}	4.41%
Deep Western Mediterranean sea (2009)	[31, 106]	21	144	1.01×10^{-3}	9.52%
Denmark, Faroe Islands (1997)	[31, 120]	20	146	9.38×10^{-4}	5.00%
East Bass Strait (1994)	[31, 19]	59	628	1.50×10^{-4}	3.39%
Eastern Corsican Coast (2012)	[31, 111]	39	413	2.29×10^{-4}	2.56%
Falkland Islands (1990)	[31, 25]	44	373	3.16×10^{-4}	2.27%
Lake Paajarvi, littoral zone, Finland	[29]	27	122	1.81×10^{-3}	7.41%
Lake Pyhajarvi, littoral zone, Finland	[29]	25	115	1.89×10^{-3}	8.00%
Florida Bay (2006)	[31, 101]	47	318	4.65×10^{-4}	4.26%
Galapagos (2006)	[31, 95]	33	183	9.85×10^{-4}	3.03%
Galapagos, Floreana rocky reef (2000)	[31, 84]	43	327	4.02×10^{-4}	2.33%
Everglades Graminoids	[33, 109]	66	793	1.05×10^{-4}	4.55%
Greenland, West Coast (1997)	[31, 90]	22	151	9.65×10^{-4}	4.55%
Guinea (1985)	[31, 42]	35	434	1.86×10^{-4}	2.86%
Guinea (1998)	[31, 88]	44	507	1.71×10^{-4}	2.27%
Guinea (2004)	[31, 42]	35	433	1.87×10^{-4}	2.86%
Gulf of California (1990)	[31, 67]	34	371	2.47×10^{-4}	2.94%
Gulf of Carpentaria (1990)	[31, 85]	83	1138	6.41×10^{-5}	4.82%
Gulf of Gabes (2000)	[31, 52]	41	453	2.00×10^{-4}	4.88%

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Table 1 – continued from previous page

Food web name	Ref	S	L	C	NL
Gulf of Mexico (1950)	[31, 118]	48	337	4.23×10^{-4}	2.08%
Gulf of Thailande (1963)	[31, 26]	29	163	1.09×10^{-3}	3.45%
Hudson Bay (1970)	[31, 57]	40	449	1.98×10^{-4}	5.00%
Huizache-Caimanero (1984)	[31, 122]	26	215	5.62×10^{-4}	3.85%
Humboldt Current (1995)	[31, 103]	33	204	7.93×10^{-4}	3.03%
Iceland (1950)	[31, 18]	24	194	6.38×10^{-4}	4.17%
Icelandic shelf (1997)	[31, 98]	21	140	1.07×10^{-3}	4.76%
Independence Bay (1996)	[31, 104]	20	97	2.13×10^{-3}	5.00%
Irish Sea (1973)	[31, 65]	53	690	1.11×10^{-4}	5.66%
Jalisco and Colima Coast (1995)	[31, 40]	38	396	2.42×10^{-4}	5.26%
Jurien Bay (2007)	[31, 70]	80	749	1.43×10^{-4}	8.75%
Kaloko Honokohau (2005)	[31, 116]	26	141	1.31×10^{-3}	3.85%
Lesser Antilles (2001)	[31, 71]	31	287	3.76×10^{-4}	3.23%
Little Rock Lake, Wisconsin	[74]	182	2612	2.67×10^{-5}	0.55%
Looe Key National Marine Sanctuary (1980)	[31, 113]	20	144	9.65×10^{-4}	5.00%
Malangen Fjord (2017)	[31, 115]	36	240	6.25×10^{-4}	11.11%
Tasek Bera swamp, Malaysia	[29]	27	97	2.87×10^{-3}	7.41%
Mangrove Estuary - Dry Season	[33, 109]	94	1339	5.24×10^{-5}	3.19%
Mangrove Estuary - Wet Season	[33, 109]	94	1340	5.24×10^{-5}	3.19%
Mauritania (1987)	[31, 100]	38	374	2.72×10^{-4}	2.63%
Mauritania (1998)	[31, 100]	38	372	2.75×10^{-4}	2.63%
Mauritanie (1991)	[31, 47]	51	635	1.26×10^{-4}	1.96%
Medes Island MPA (2000)	[31, 32]	67	767	1.14×10^{-4}	2.99%
Morocco (1985)	[31, 45]	38	378	2.66×10^{-4}	2.63%
Mount St Michel Bay (2003)	[31, 66]	24	89	3.03×10^{-3}	4.17%
Ningaloo (2007)	[31, 61]	53	628	1.34×10^{-4}	5.66%
North Atlantic (1950)	[31, 88]	38	269	5.25×10^{-4}	2.63%
North Atlantic (1997)	[31, 88]	38	269	5.25×10^{-4}	2.63%
North Benguela	[31, 119]	26	208	6.01×10^{-4}	3.85%
North Benguela (1967)	[31, 119]	26	208	6.01×10^{-4}	3.85%
North Benguela (1990)	[31, 119]	26	208	6.01×10^{-4}	3.85%
North East Pacific (1950)	[31, 119]	56	559	1.79×10^{-4}	1.79%
North Sea (1974)	[31, 14]	32	241	5.51×10^{-4}	3.12%
North Sea (1981)	[31, 27]	29	152	1.26×10^{-3}	3.45%
North South of China Sea (1970)	[31, 24]	38	471	1.71×10^{-4}	2.63%
Northern Benguela (1956)	[31, 55]	32	234	5.84×10^{-4}	3.12%
Northern British Columbia (1950)	[31, 2]	53	483	2.27×10^{-4}	3.77%
Northern British Columbia (2000)	[31, 2]	53	487	2.23×10^{-4}	3.77%
Northern Californian Current (1960)	[31, 117]	36	152	1.56×10^{-3}	2.78%
Northern Californian Current (1990)	[31, 38]	63	775	1.05×10^{-4}	4.76%
Northern Gulf of Mexico (2005)	[31, 96]	75	2244	1.49×10^{-5}	1.33%
Northern Gulf of St Lawrence (1990)	[31, 99]	32	343	2.72×10^{-4}	3.12%
Northern Gulf St Lawrence (1985)	[31, 78]	32	308	3.37×10^{-4}	3.12%
Northern Humboldt Current (1997)	[31, 103]	33	210	7.48×10^{-4}	3.03%
Paranà River Floodplain (1992)	[31, 6]	40	224	7.97×10^{-4}	2.50%
Peru (1953)	[31, 60]	20	108	1.71×10^{-3}	5.00%
Peru (1960)	[31, 60]	20	109	1.68×10^{-3}	5.00%

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Table 1 – continued from previous page

Food web name	Ref	S	L	C	NL
Peru (1973)	[31, 60]	20	113	1.57×10^{-3}	5.00%
Port Cros (1998)	[31, 110]	41	356	3.24×10^{-4}	2.44%
Port Phillip Bay (1994)	[31, 39]	34	331	3.10×10^{-4}	2.94%
Prince William Sound (1994)	[31, 86]	48	404	2.94×10^{-4}	6.25%
Raja Ampat (1990)	[31, 93]	98	2614	1.43×10^{-5}	2.04%
Raja Ampat (2005)	[31, 93]	98	2612	1.44×10^{-5}	2.04%
Restored Alosine Biomass (2000)	[31]	59	991	6.01×10^{-5}	1.69%
Ria-Lake Tapajos (2013)	[31, 22]	35	341	3.01×10^{-4}	2.86%
River Rheido, Wales	[29]	18	92	2.13×10^{-3}	5.56%
Rocky shore, Monterey Bay, California	[29]	35	167	1.25×10^{-3}	2.86%
Salt meadow, New Zealand	[29]	45	89	5.68×10^{-3}	2.22%
Sand beach, South Africa	[29]	21	76	3.64×10^{-3}	9.52%
Santa Pola Bay (2001)	[31, 13]	41	331	3.74×10^{-4}	4.88%
Sechura Bay (1996)	[31, 105]	21	101	2.06×10^{-3}	4.76%
Shallow sublittoral, Cape Ann, Massachusetts	[29]	25	92	2.95×10^{-3}	8.00%
Sierra Leone (1964)	[31, 54]	44	449	2.18×10^{-4}	2.27%
Sierra Leone (1978)	[31, 54]	44	458	2.10×10^{-4}	2.27%
Sierra Leone (1990)	[31, 54]	44	459	2.09×10^{-4}	2.27%
Sinaloa sur Mexico (1994)	[31, 97]	37	347	3.07×10^{-4}	2.70%
Sirinhaèm River (2013)	[31, 69]	25	178	7.89×10^{-4}	4.00%
Sìtios Novos reservoir (2011)	[31, 16]	31	206	7.31×10^{-4}	3.23%
Sonda Campeche Act (1988)	[31, 121]	25	187	7.15×10^{-4}	4.00%
South Benguela	[31, 119]	32	263	4.63×10^{-4}	3.12%
South Benguela (1900)	[31, 119]	32	263	4.63×10^{-4}	3.12%
South Benguela (1978)	[31, 119]	32	263	4.63×10^{-4}	3.12%
South East Alaska (1963)	[31, 44]	40	514	1.51×10^{-4}	2.50%
South of Benguela (1960)	[31, 119]	32	263	4.63×10^{-4}	3.12%
South Shetlands (1990)	[31, 17]	30	238	5.30×10^{-4}	3.33%
South western Gulf of Mexico (1970)	[31, 9]	24	152	1.04×10^{-3}	4.17%
Sri Lanka (2000)	[31, 51]	39	375	2.77×10^{-4}	2.56%
Strait of Georgia (1950)	[31, 94, 73]	55	523	2.01×10^{-4}	1.82%
Swamp, south Florida	[29]	27	74	4.93×10^{-3}	3.70%
Sørfjord (1993)	[31, 37]	25	159	9.89×10^{-4}	4.00%
Tampa Bay (1950)	[31, 118]	52	442	2.66×10^{-4}	1.92%
Tagus estuary, Portugal	[29]	29	136	1.57×10^{-3}	6.90%
Tasmanian Seamounts Marine Reserve (1992)	[31, 20]	25	138	1.31×10^{-3}	4.00%
Terminos Lagoon (1980)	[31, 72]	20	163	7.53×10^{-4}	5.00%
Thermaikos Gulf (1998)	[31, 36]	33	357	2.59×10^{-4}	6.06%
Tropical plankton community, Pacific	[29]	23	155	9.57×10^{-4}	4.35%
USA, Mid Atlantic Bight (1995)	[31, 81]	55	650	1.30×10^{-4}	1.82%
USA, South Atlantic Continental Shelf (1995)	[31, 82]	42	514	1.59×10^{-4}	2.38%
Virgin Islands (1960)	[31, 87]	21	161	8.10×10^{-4}	4.76%
West Baffin Bay, Coastal and Shelf (2016)	[31, 91]	30	222	6.09×10^{-4}	3.33%

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Table 1 – continued from previous page

Food web name	Ref	S	L	C	NL
West coast of Sabah (1972)	[31, 41]	29	243	4.91×10^{-4}	3.45%
West Florida Shelf (1985)	[31, 114]	83	1045	7.60×10^{-5}	2.41%
West Florida Shelf Historic Model (1950)	[31, 23]	70	1232	4.61×10^{-5}	4.29%
West Scotland (2000)	[31, 48]	37	407	2.23×10^{-4}	2.70%
West scotland DeepSea (1974)	[31, 58]	34	322	3.28×10^{-4}	2.94%
Western Antarctic Peninsula (1996)	[31, 34]	35	198	8.93×10^{-4}	2.86%
Western Channel (1973)	[31, 7]	52	475	2.30×10^{-4}	3.85%
Western Channel (1993)	[31, 7]	52	475	2.30×10^{-4}	3.85%
Western Tropical Pacific Ocean (1990)	[31, 43]	20	150	8.89×10^{-4}	5.00%
Ythan estuary, Aberdeenshire, Scotland	[59]	134	721	2.58×10^{-4}	0.75%
Yucatan (1987)	[31, 8]	21	131	1.22×10^{-3}	4.76%

2 Core Periphery

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Food web name	Core periphery composition
Lower Chesapeake Bay	
Middle Chesapeake Bay	
Upper Chesapeake Bay	
Chesapeake Bay Mesohaline	
Crystal River Creek - Control	
Crystal River Creek - Delta Temp	
Charca de Maspalomas	
Lake Michigan	
Mondego Estuary - Zostrea site	
Narragansett Bay Model	
St. Marks River (Florida)	
Aegean Sea (2003)	
Albatross Bay (1986)	
Aleutian Islands (1963)	
Alto Golfo de California	
Antarctic (1970)	

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Table 2 – continued from previous page

Food web name	Core periphery composition
Apalachicola Bay (2000)	
Arctic seas	
Australia North West Shelf (1986)	
Azores (1997)	
Azores archipelago (1997)	
Baie de Seine (2000)	
Bamboung (2003)	
Bamboung (2006)	
Barnegat Bay (1981)	
Barra Del Chuy (1992)	
Bay of Biscay (1970)	
Bay of Biscay (1980)	
Bay of Biscay (1994)	
Bay of Biscay (1998)	
Bay of Biscay (2013)	
Florida Bay - dry season	
Florida Bay - wet season	
Bolinao Coral Reef (1980)	
British Columbia coast (1950)	
Calvi Bay (1998)	
Cap de Creus MPA - whole (2008)	
Cape Verde (1981)	
Celtic Sea-Biscay (1980)	
Celtic Sea-Biscay (2012)	
Celtic Sea (1980)	
Celtic Sea (1985)	
Celtic Sea (2013)	
Central Atlantic (1950)	
Central Atlantic (1990)	
Central Baltic Sea (1974)	

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Table 2 – continued from previous page

Food web name	Core periphery composition
Central Chile (1998)	
Central Gulf of California (1978)	
Cerbère-Banyuls MPA (2013)	
Chesapeake (1950)	
Contemporary Alosine (2000)	
Cypress Dry Season	
Cypress Wet Season	
Deep Western Mediterranean sea (2009)	
Denmark, Faroe Islands (1997)	
East Bass Strait (1994)	
Eastern Corsican Coast (2012)	
Falkland Islands (1990)	
Lake Paajarvi, littoral zone, Finland	
Lake Pyhajarvi, littoral zone, Finland	
Florida Bay (2006)	
Galapagos (2006)	
Galapagos, Floreana rocky reef (2000)	
Everglades Graminoids	
Greenland, West Coast (1997)	
Guinea (1985)	
Guinea (1998)	
Guinea (2004)	
Gulf of California (1990)	
Gulf of Carpentaria (1990)	
Gulf of Gabes (2000)	
Gulf of Mexico (1950)	
Gulf of Thailande (1963)	

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Table 2 – continued from previous page

Food web name	Core periphery composition
Hudson Bay (1970)	
Huizache-Caimanero (1984)	
Humboldt Current (1995)	
Iceland (1950)	
Icelandic shelf (1997)	
Independence Bay (1996)	
Irish Sea (1973)	
Jalisco and Colima Coast (1995)	
Jurien Bay (2007)	
Kaloko Honokohau (2005)	
Lesser Antilles (2001)	
Little Rock Lake, Wisconsin	
Looe Key National Marine Sanctuary (1980)	
Malangen Fjord (2017)	
Tasek Bera swamp, Malaysia	
Mangrove Estuary - Dry Season	
Mangrove Estuary - Wet Season	
Mauritania (1987)	
Mauritania (1998)	
Mauritanie (1991)	
Medes Island MPA (2000)	
Morocco (1985)	
Mount St Michel Bay (2003)	
Ningaloo (2007)	
North Atlantic (1950)	
North Atlantic (1997)	
North Benguela	
North Benguela (1900)	
North Benguela (1967)	
North Benguela (1990)	

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Food web name	Core periphery composition
North East Pacific (1950)	83.9% 16.1%
North Sea (1974)	96.9% 3.1%
North Sea (1981)	89.7% 10.3%
North South of China Sea (1970)	94.7% 5.3%
Northern Benguela (1956)	81.2% 18.8%
Northern British Columbia (1950)	83.0% 17.0%
Northern British Columbia (2000)	83.0% 17.0%
Northern Californian Current (1960)	94.4% 5.6%
Northern Californian Current (1990)	87.3% 12.7%
Northern Gulf of Mexico (2005)	96.0% 4.0%
Northern Gulf of St Lawrence (1990)	96.9% 3.1%
Northern Gulf St Lawrence (1985)	96.9% 3.1%
Northern Humboldt Current (1997)	93.9% 6.1%
Paraná River Floodplain (1992)	87.5% 12.5%
Peru (1953)	90.0% 10.0%
Peru (1960)	90.0% 10.0%
Peru (1973)	90.0% 10.0%
Port Cros (1998)	85.4% 14.6%
Port Phillip Bay (1994)	82.4% 17.6%
Prince William Sound (1994)	79.2% 20.8%
Raja Ampat (1990)	90.8% 9.2%
Raja Ampat (2005)	90.8% 9.2%
Restored Alosine Biomass (2000)	98.3% 1.7%
Ria-Lake Tapajos (2013)	91.4% 8.6%

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Table 2 – continued from previous page

Food web name	Core periphery composition
Rocky shore, Monterey Bay, California	
Salt meadow, New Zealand	
Sand beach, South Africa	
Santa Pola Bay (2001)	
Sechura Bay (1996)	
Shallow sublittoral, Cape Ann, Massachusetts	
Sierra Leone (1964)	
Sierra Leone 1978 (1978)	
Sierra Leone (1990)	
Sinaloa sur MEXICO (1994)	
Sirinhaém River (2013)	
Sítios Novos reservoir (2011)	
Sonda Campeche Act (1988)	
South Benguela	
South Benguela (1900)	
South Benguela (1978)	
South East Alaska (1963)	
South of Benguela (1960)	
South Shetlands (1990)	
South western Gulf of Mexico (1970)	
Sri Lanka (2000)	
Strait of Georgia (1950)	
Swamp, south Florida	
Sørfjord (1993)	
Tampa Bay (1950)	
Tagus estuary, Portugal	
Tasmanian Seamounts Marine Reserve (1992)	
Terminos Lagoon (1980)	
Thermaikos Gulf (1998)	

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Table 2 – continued from previous page

Food web name	Core periphery composition
Tropical plankton community, Pacific	87.0% 13.0%
USA, Mid Atlantic Bight (1995)	89.1% 10.9%
USA, South Atlantic Continental Shelf (1995)	88.1% 11.9%
Virgin Islands (1960)	90.5% 9.5%
West Baffin Bay, Coastal and Shelf (2016)	93.3% 6.7%
West coast of Sabah (1972)	93.1% 6.9%
West Florida Shelf (1985)	94.0% 6.0%
West Florida Shelf Historic Model (1950)	94.3% 5.7%
West Scotland (2000)	97.3% 2.7%
West scotland DeepSea (1974)	94.1% 5.9%
Western Antarctic Peninsula (1996)	91.4% 8.6%
Western Channel (1973)	94.2% 5.8%
Western Channel (1993)	94.2% 5.8%
Western Tropical Pacific Ocean (1990)	85.0% 15.0%
Ythan estuary, Aberdeenshire, Scotland	73.9% 26.1%
Yucatan (1987)	85.7% 14.3%

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