

Differentiating successful and failed molluscan invaders in estuarine ecosystems

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Appendix 2a. Oyster associate gastropod species with reported historical abundances (individual and cross study mean abundance scores), lower salinity limits, and developmental modes. Species in **bold** were successful invaders of San Francisco Bay, California, USA. For Literature Cited list, see Appendix 1

Family	Gastropod species	Reported as oyster associates										Abundance records					References	Developmental mode	References
		Wells (1961)	Maurer & Wailing (1973)	Winkley (1888)	Larsen (1985)	Verrill & Smith (1874)	Frey (1946)	J.T. Carlton (pers. com.)	Michelli & Peterson (1999)	Mean historical abundance	Smith & Prime (1870)	Perkins (1869)	Baich (1869)	Hubbard & Smith (1865)	Smith (1862)	Smith (1867)			
Acteonidae	<i>Rictaxis punctostriatus</i> (C. B. Adams, 1840)		x						2.8	2	3	0	2	2	8	3	Lippson and Lippson 1997	Plank.	NOAA NMSP 2005
Caecidae	<i>Caecum pulchellum</i> Stimpson, 1851	x							1.7	2	0	0	0	8	0	18	Wass et al. 1972	Plank.	Scheltema 1984
Calyptraeidae	<i>Crepidula convexa</i> Say, 1822	x	x		x	x	x		7.0	5	8	5	8	8	8	12	Lippson and Lippson 1997	Direct	Scheltema 1984
Calyptraeidae	<i>Crepidula fornicata</i> (Linne, 1758)	x	x	x					8.0	8	6	8	8	10	8	14	Lippson and Lippson 1997	Plank.	Scheltema 1984
Calyptraeidae	<i>Crepidula plana</i> Say, 1822	x	x	x					7.7	8	6	8	8	8	8	15	Leathem and Maurer 1975	Plank.	Scheltema 1984
Cerithiidae	<i>Bittiolium alternatum</i> (Say, 1822)				x				8.2	8	5	10	8	10	8	18	Verrill and Smith 1874	Plank.	Pechenik 1986
Cerithiidae	<i>Bittiolium varium</i> (Pfeiffer, 1840)	x							0.2	1	0	0	0	0	0	10	Lippson and Lippson 1997	Plank.	Scheltema 1984
Cerithiidae	<i>Sella adamsii</i> (H. C. Lea, 1846)	x							3.2	7	0	5	0	7	0	25	Leathem and Maurer 1975	Plank.	Scheltema 1984
Cerithiopsidae	<i>Cerithiopsis emersonii</i> (C. B. Adams, 1839)								1.8	7	1	3	0	0	0	31	Figley 2003	Plank.	Scheltema 1984
Cerithiopsidae	<i>Cerithiopsis greenii</i> (C. B. Adams, 1839)	x		x	x				2.2	2	1	4	2	2	2	12	Wass et al. 1972	Plank.	Scheltema 1984
Columbellidae	<i>Astyrus lunata</i> (Say, 1826)	x	x	x		x			6.3	4	5	6	8	7	8	12	Wass et al. 1972	Plank.	Scheltema 1984
Columbellidae	<i>Costoanachis avara</i> (Say, 1822)	x	x						4.5	7	5	0	8	7	0	16	Marsh 1976	Plank.	Scheltema 1984
Columbellidae	<i>Costoanachis lafresnayi</i> (Fischer & Bernardi, 1857)	x	x						3.3	7	0	5	0	0	8	18	Wass et al. 1972	Plank.	Scheltema 1984
Cylichnidae	<i>Acteocina canaliculata</i> (Say, 1826)		x	x	x				5.2	7	0	5	8	3	8	18	Leathem and Maurer 1975	Plank.	Mikkelsen and Mikkelsen 1984
Ellobiidae	<i>Melampus bidentatus</i> Say, 1822		x						6.0	5	9	5	8	9	0	3	Lippson and Lippson 1997	Plank.	Scheltema 1984
Ellobiidae	<i>Myosotella myosotis</i> (Draparnaud, 1801)	x	x	x		x			3.5	1	9	3	8	0	0	1	Barnes 1994	Direct	Fofonoff et al. 2005
Epitonidae	<i>Epitonium humphreysi</i> (Kiener, 1838)		x						0.2	1	0	0	0	0	0	18	Leathem and Maurer 1975	Plank.	Robertson 1994
Epitonidae	<i>Epitonium rupicola</i> (Kurtz, 1860)		x		x		x		1.2	2	1	1	0	1	2	18	Leathem and Maurer 1975	Plank.	Scheltema 1984
Fissurellidae	<i>Diodora cayenensis</i> (Lamarck, 1822)	x							0.0	0	0	0	0	0	0	30	Carlton, J.T. (pers. comm.)	Direct	Fox 2004
Haminoeidae	<i>Haminoea solitaria</i> (Say, 1822)		x						2.0	2	0	4	2	2	2	5	Lippson and Lippson 1997	Plank.	Scheltema 1984
Hydrobiidae	<i>Hydrobia truncata</i> (Vanatta, 1924)	x		x	x	x			7.3	8	6	6	8	8	8	1	Wass et al. 1972	Direct	Rehder 1997
Littorinidae	<i>Ilyanassa obsoleta</i> (Say, 1822)		x	x					8.7	9	9	9	8	9	8	10	Lippson and Lippson 1997	Plank.	Scheltema 1984
Littorinidae	<i>Lacuna pallidula</i> (da Costa, 1778)	x					x		0.0	0	0	0	0	0	0	15	Barnes 1994	Direct	Hughes 1986
Littorinidae	<i>Littoraria imorata</i> (Say, 1822)							x	1.0	1	3	0	0	0	2	5	Lippson and Lippson 1997	Plank.	Thiriot-Quievreux 1983
Littorinidae	<i>Littorina littorea</i> (Linne, 1758)				x				0.8	0	0	5	0	0	0	10	Barnes 1994	Plank.	Scheltema 1984
Littorinidae	<i>Littorina obtusata</i> (Linne, 1758)			x					7.5	8	5	8	8	8	8	28	Leathem and Maurer 1975	Direct	Scheltema 1984
Littorinidae	<i>Littorina saxatilis</i> (Olivi, 1792)	x			x				7.7	8	5	8	8	9	8	5	Sokolova 2000	Direct	Scheltema 1984
Melongenidae	<i>Busycon carica</i> (Gmelin, 1791)		x	x		x			5.3	4	7	5	8	0	8	20	Leathem and Maurer 1975	Direct	Scheltema 1984
Melongenidae	<i>Busycon sinistrum</i> Hollister, 1958		x						0.0	0	0	0	0	0	0	30	Wass et al. 1972	Direct	Ruppert and Fox 1988
Melongenidae	<i>Busycotypus canaliculatus</i> (Linne, 1758)		x	x		x			7.0	5	7	6	8	8	8	18	Lippson and Lippson 1997	Direct	Scheltema 1984
Muricidae	<i>Eupleura caudata</i> (Say, 1822)		x	x		x			4.8	4	3	5	8	7	2	14	Lippson and Lippson 1997	Direct	Scheltema 1984
Muricidae	<i>Nucella lapillus</i> (Linne, 1758)							x	1.5	7	0	0	0	0	2	25	Stickle et al. 1985	Direct	Scheltema 1984
Muricidae	<i>Urosalpinx cinerea</i> (Say, 1822)	x	x		x	x			6.0	5	9	5	8	7	2	11	Carriker 1955	Direct	Scheltema 1984
Nassariidae	<i>Nassarius trivittatus</i> (Say, 1822)			x	x				7.0	5	5	8	8	8	8	10	Lippson and Lippson 1997	Plank.	Scheltema 1984
Nassariidae	<i>Nassarius vibex</i> (Say, 1822)	x	x		x		x		3.0	8	3	3	2	0	2	10	Lippson and Lippson 1997	Plank.	Scheltema 1984
Naticidae	<i>Euspira heros</i> (Say, 1822)				x				3.2	5	3	5	2	2	2	25	Leathem and Maurer 1975	Plank.	Scheltema 1984
Naticidae	<i>Euspira immaculata</i> (Totten, 1835)		x						0.3	1	0	0	0	1	0	30	Fioley 2003; Carlton pers. comm	Plank.	Scheltema 1984
Naticidae	<i>Neverita duplicata</i> (Say, 1822)			x					5.5	5	5	5	8	2	8	18	Lippson and Lippson 1997	Plank.	Scheltema 1984
Ovulidae	<i>Simniaena uniplicata</i> (G. B. Sowerby II, 1848)	x							0.2	0	1	0	0	0	0	30	Carlton pers. comm.	ND	
Pyramidellidae	<i>Boonea bisuturalis</i> (Say, 1821)			x		x	x		4.7	5	6	5	8	2	2	16	Marsh 1976	Plank.	Scheltema 1984
Pyramidellidae	<i>Boonea impressa</i> (Say, 1822)	x	x		x				0.7	1	3	0	0	0	0	11	Leathem and Maurer 1975	Plank.	Robertson and Mau-Lastovicka 1979
Pyramidellidae	<i>Boonea seminuda</i> (C. B. Adams, 1837)		x		x				4.2	8	1	0	8	0	8	25	Carlton, J.T. (pers. comm.)	Plank.	Scheltema 1984
Pyramidellidae	<i>Fargoa bartschi</i> (Winkley, 1909)		x						0.0	0	0	0	0	0	0	ND		Plank.	Robertson 1996
Pyramidellidae	<i>Fargoa catesi</i> (Bartsch, 1909)		x		x				0.0	0	0	0	0	0	0	18	Wass et al. 1972	Plank.	Robertson 1978
Pyramidellidae	<i>Fargoa dianthophila</i> (Wells & Wells, 1961)		x						0.0	0	0	0	0	0	0	24	Wells 1961	Plank.	Robertson 1978
Pyramidellidae	<i>Sayella fusca</i> (C. B. Adams, 1839)			x	x	x			1.8	2	5	2	0	2	0	18	Wass et al. 1972	ND	
Pyramidellidae	<i>Turbonilla interrupta</i> (Totten, 1835)	x	x	x					4.0	4	2	0	8	2	8	16	Marsh 1976	ND	
Rissoidea	<i>Onoba aculeus</i> (Gould, 1841)					x			1.0	1	5	0	0	0	0	ND		Direct	Rehder 1997
Skenopiopsidae	<i>Skeneopsis planorbis</i> (Fabricius, 1780)				x				0.5	0	3	0	0	0	0	18	Leathem and Maurer 1975	Direct	Abbott 1974
Triphoridae	<i>Marshallora nigrocineta</i> (C. B. Adams, 1839)					x			4.3	2	1	5	8	2	8	12	Lippson and Lippson 1997	Plank.	Scheltema 1984
Turridae	<i>Pyrgocythara pilcosa</i> (C. B. Adams, 1850)	x		x					1.3	3	1	1	0	3	0	14	Lippson and Lippson 1997	Plank.	Rehder 1997

[ND = No Data]

Appendix 2b. Oyster associate bivalve species with reported historical abundances (individual and cross study mean abundance scores), lower salinity limits, and developmental modes. Species in bold were successful invaders of San Francisco Bay, California, USA. For Literature Cited list, see Appendix 1

Family	Bivalve species	Reported as oyster associates								Abundance records						References	Developmental mode	References	
		Wells (1961)	Maurer & Watling (1973)	Winkley (1888)	Larsen (1985)	Verrill & Smith (1874)	Frey (1946)	J.T. Carlton (pers. com.)	Micheli & Peterson (1999)	Mean historical abundance	Smith & Prime (1870)	Perkins (1869)	Balch (1899)	Hubbard & Smith (1865)	Smith (1862)				Smith (1887)
Anomiidae	<i>Anomia simplex</i> Orbigny, 1842	x	x	x	x	x			6.5	6	3	10	8	10	2	15	Castagna and Chanley 1973	Plank.	Chanley and Andrews 1971
Arcidae	<i>Anadara ovalis</i> (Bruguiere, 1798)	x				x			4.7	0	6	4	8	2	8	15	Castagna and Chanley 1973	Plank.	Chanley and Andrews 1971
Arcidae	<i>Anadara transversa</i> (Say, 1822)				x	x			6.8	7	5	5	8	8	8	15	Castagna and Chanley 1973	Plank.	Chanley and Andrews 1971
Cardiidae	<i>Cerastoderma pinnulatum</i> (Conrad, 1831)			x					1.2	2	1	2	0	2	0	25	Maurer et al. 1974	Plank.	Scheltema 1984
Cardiidae	<i>Crassinella lunulata</i> (Conrad, 1834)						x		1.8	2	0	1	0	8	0	25	NOAA NMSP 2005; Carlton, J.T. (pers. com.)	Plank.	NOAA NMSP 2005
Cardiidae	<i>Laevicardium mortoni</i> (Conrad, 1830)						x		5.7	9	3	8	2	10	2	15	Castagna and Chanley 1973	Plank.	Chanley and Andrews 1971, Scheltema 1984
Corbulidae	<i>Corbula contracta</i> Say, 1822			x					1	3	3	0	0	0	0	20	Maurer et al. 1974	Plank.	NOAA NMSP 2005
Corbulidae	<i>Corbula swiftiana</i> C. B. Adams, 1852	x							0	0	0	0	0	0	5	Flores-Andolais et al. 1988		ND	
Dreissenidae	<i>Mytilopsis leucophaeata</i> (Conrad, 1831)	x			x		x		0	0	0	0	0	0	0	0	Lippson and Lippson 1997	Plank.	Chanley and Andrews 1971
Hiatellidae	<i>Hiatella arctica</i> (Linne, 1767)			x					0.8	0	3	0	0	2	0	25	Carlton, J.T. (pers. com.)	Plank.	Scheltema 1984
Lyonsiidae	<i>Lyonsia hyalina</i> Conrad, 1831	x	x		x				4.7	3	3	4	8	2	8	15	Castagna and Chanley 1973	Plank.	Chanley and Andrews 1971
Lyonsiidae	<i>Pandora gouldiana</i> Dall, 1886			x					5.5	2	8	4	8	3	8	23	Maurer et al. 1974	Plank.	Chanley and Andrews 1971
Mactridae	<i>Mulinia lateralis</i> (Say, 1822)	x	x	x	x		x		5.8	3	8	8	8	0	8	8	Gosner 1978	Plank.	Chanley and Andrews 1971
Mactridae	<i>Spisula solidissima</i> (Dillwyn, 1817)		x						4.8	6	3	4	8	0	8	27	Maurer et al. 1974	Plank.	Chanley and Andrews 1971
Montacutidae	<i>Mysella planulata</i> (Stimpson, 1851)	x							1.8	2	3	0	2	2	2	15	Andrews 1953	Plank.	Franz 1973
Myidae	<i>Mya arenaria</i> Linne, 1758	x			x		x		8	6	9	8	8	9	8	5	Maurer et al. 1974	Plank.	Chanley and Andrews 1971
Mytilidae	<i>Amygdalum papyrium</i> (Conrad, 1846)		x				x		0	0	0	0	0	0	0	8	Maurer et al. 1974	Plank.	Chanley and Andrews 1971
Mytilidae	<i>Geukensia demissa</i> (Dillwyn, 1817)	x	x				x		8	6	9	9	8	8	8	5	Maurer et al. 1974	Plank.	Chanley and Andrews 1971
Mytilidae	<i>Ischadium recurvum</i> (Rafinesque, 1820)	x			x	x	x		1.3	0	8	0	0	0	0	8	Maurer et al. 1974	Plank.	Chanley and Andrews 1971
Mytilidae	<i>Mytilus edulis</i> Linne, 1758	x	x	x		x			6.2	3	5	9	8	4	8	15	Maurer et al. 1974	Plank.	Chanley and Andrews 1971
Noetiidae	<i>Noetia ponderosa</i> (Say, 1822)	x							0.2	1	0	0	0	0	0	17	Maurer et al. 1974	Plank.	Chanley and Andrews 1971
Nuculidae	<i>Nucula proxima</i> Say, 1822		x						7.8	9	5	9	8	8	8	20	Castagna and Chanley 1973	Plank.	Scheltema 1984
Ostreidae	<i>Crassostrea virginica</i> (Gmelin, 1791)	x	x	x	x	x	x		6.5	0	8	8	8	7	8	6	Galtsoff 1964	Plank.	Chanley and Andrews 1971
Ostreidae	<i>Ostrea equestris</i> Say, 1834	x							0	0	0	0	0	0	0	20	Galtsoff 1964	Plank.	Galtsoff 1964
Pectinidae	<i>Argopecten irradians</i> (Lamarck, 1819)	x				x			4.7	7	0	7	2	10	2	15	Belding 1912	Plank.	Belding 1912, Chanley and Andrews 1971
Petricolidae	<i>Petricolaria pholadiformis</i> (Lamarck, 1818)	x	x	x					5.5	2	8	5	8	2	8	15	Maurer et al. 1974	Plank.	Chanley and Andrews 1971
Petricolidae	<i>Zirfaea crispata</i> Linne, 1758						x		3.2	3	0	0	8	0	8	25	Carlton, J.T. (pers. com.)	Plank.	Chanley and Andrews 1971
Pholadidae	<i>Barnea truncata</i> (Say, 1822)		x						1.7	1	5	0	2	0	2	13	Maurer et al. 1974	Plank.	Chanley and Andrews 1971
Pholadidae	<i>Cyrtopleura costata</i> (Linne, 1758)		x						0.3	0	0	0	0	0	2	10	Castagna and Chanley 1973	Plank.	Chanley and Andrews 1971
Pholadidae	<i>Diplothyra smithii</i> Tryon, 1862		x						0.7	0	0	0	2	0	2	25	Menzel 1964	Plank.	Chestnut 1980
Semelidae	<i>Cumingia tellinoides</i> (Conrad, 1831)		x	x					2.5	1	1	2	2	7	2	25	Carlton, J.T. (pers. com.)	Plank.	Sullivan 1948
Solecurtidae	<i>Tagelus divisus</i> (Spengler, 1794)		x					x	1.3	0	0	0	0	0	8	15	Maurer et al. 1974	Plank.	Williams and Porter 1971
Solecurtidae	<i>Tagelus plebeius</i> (Lightfoot, 1786)		x						1.3	0	0	0	0	0	8	10	Andrews 1953	Plank.	Chanley and Andrews 1971
Solemyacidae	<i>Solemya velum</i> Say, 1822						x		2.7	2	5	2	2	0	2	18	Castagna and Chanley 1973	Plank.	Williams and Porter 1971
Solenidae	<i>Solen viridis</i> Say, 1821		x						0	0	0	0	0	0	0	13	Maurer et al. 1974	Plank.	Williams and Porter 1971
Tellinidae	<i>Macoma balthica</i> (Linne, 1758)		x		x		x		6	0	8	4	8	8	8	5	Castagna and Chanley 1973	Plank.	Chanley and Andrews 1971
Tellinidae	<i>Macoma mitchelli</i> Dall, 1895				x				0	0	0	0	0	0	0	2	Castagna and Chanley 1973	Plank.	Chanley and Andrews 1971
Tellinidae	<i>Tellina agilis</i> Stimpson, 1857		x	x	x		x		4.3	7	0	4	8	7	0	13	Maurer et al. 1974	Plank.	Chanley and Andrews 1971
Tellinidae	<i>Tellina versicolor</i> DeKay, 1843							x	0	0	0	0	0	0	0	20	Maurer et al. 1974		ND
Veneridae	<i>Gemma gemma</i> (Totten, 1834)	x	x						7	7	3	7	8	9	8	5	Lippson and Lippson 1997	Direct	Selmer 1967
Veneridae	<i>Mercenaria campechiensis</i> (Gmelin, 1791)						x		0	0	0	0	0	0	0	18	Wass et al. 1972	Plank.	Loosanoff et al. 1966
Veneridae	<i>Mercenaria mercenaria</i> (Linne, 1758)	x	x	x	x	x			8.2	9	8	9	8	7	8	10	Lippson and Lippson 1997	Plank.	Chanley and Andrews 1971

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