

appendix **C**

Summary of Literature on the Tolerance of Chesapeake Bay Macrobenthic Species to Low Dissolved Oxygen Conditions

Species	Life Stage	Dissolved Oxygen (mg liter ⁻¹)	Temp (°C)	Observed Response	Reference
Mollusca					
<i>Abra alba</i>	Adult	0	10	LD ₅₀ in 200 hrs	Dries and Theede 1974
<i>Cardium edule</i>	Adult	0	10	50% mortality in 7 days	Thamdrup 1935 referenced in O'Connor (unpublished manuscript)
	Adult	0.15	10	50% mortality in 102 hrs (4.3 days) without sulfide, 96 hrs (4 days) with sulfide (50 mg liter ⁻¹ Na ₂ S·9H ₂ O	Theede et al. 1969; Theede 1973
<i>Carium lamarki</i>	Adult	0	10	LD ₅₀ in - 220 hrs (9.2 days)	Dries and Theede 1974
<i>Littorina littoria</i>	Adult	0.15	10	LD ₅₀ in 365 hrs (15.2 days) without sulfide, 180 hrs (7.5 days) with sulfide; 50 mg liter ⁻¹	Theede et al. 1969; Theede 1973
<i>Littorina saxatilis</i>	Adult	0.15	10	LD ₅₀ in 365 hrs (15.2 days) without sulfide, 72 hrs (3 days) with sulfide; 50 mg liter ⁻¹	Theede et al. 1969; Theede 1973
<i>Macoma balthica</i>	Adult	0	10	4% mortality in 7 days	Thamdrup 1935; referenced in O'Connor (unpublished manuscript)
	Adult	0	10	LD ₅₀ in 500 hrs (20.8 days)	Dries and Theede 1974
<i>Mercenaria mercenaria</i>	Larvae	0.9-2.4	25	Reduced growth	Morrison 1971
		0.2	25	100% mortality in 14 days	Morrison 1971
	NR	0.9	25	0% mortality in 14 days	Morrison 1971

Species	Life Stage	Dissolved Oxygen (mg liter ⁻¹)	Temp (°C)	Observed Response	Reference
	Juvenile/ Adult (31-38 mm)	5.7	19-24	Maximum burrowing rate	Savage 1976
	NR	0.9-1.8	17-24	Reduced burrowing rate	Savage 1976
	NR	0.9	19	No mortality in 21 days and 30 days (two trials)	Savage 1976
<i>Mulina lateralis</i>	Juvenile (5 mm)	0	10	LT ₅₀ in 10.5 days without sulfide, 4.3 days with sulfide; 644 mg liter ⁻¹ Na ₂ S.9H ₂ O	Shumway and Scott 1983; referenced in O'Conner (unpublished manuscript)
	NR	0	20	LT ₅₀ in 7.5 days	Shumway and Scott 1983; referenced in O'Conner (unpublished manuscript)
<i>Mulina lateralis</i>	NR	0	30	LT ₅₀ in 2 days	Shumway and Scott 1983; referenced in O'Conner (unpublished manuscript)
	Adult (10 mm)	0	10	LT ₅₀ in 10 days without sulfide, 3.8 days with sulfide; 644 mg liter ⁻¹ Na ₂ S.9H ₂ O	Shumway and Scott 1983; referenced in O'Conner (unpublished manuscript)
	NR	0	20	LT ₅₀ in 2.5 days	Shumway and Scott 1983; referenced in O'Conner (unpublished manuscript)
	NR	0	30	LT ₅₀ in 1.8 days	Shumway and Scott 1983; referenced in O'conner (unpublished manuscript)
<i>Mya arenaria</i>	NR	0	'very low'	Survived for 'weeks'	Collip 1921; referenced in O'Conner (unpublished manuscript)
	NR	0	14	Survived 8 days	Collip 1921; referenced in O'Conner (unpublished manuscript)
	NR	0	31	Survived 1 day	Collip 1921; referenced in O'Conner (unpublished manuscript)

Species	Life Stage	Dissolved Oxygen (mg liter ⁻¹)	Temp (°C)	Observed Response	Reference
<i>Mya arenaria</i>	Adult	0.2	10	LC ₅₀ in 21 days without sulfide, 17 days with sulfide.	Theede et al. 1969; Theede 1973; referenced in O'Conner (unpublished manuscript)
<i>Mytilus edulis</i>	Adult	0.2	10	LC ₅₀ in 35 days without sulfide, 25 days with sulfide	Theede et al. 1969; Theede 1973; referenced in O'Conner (unpublished manuscript)
	Adult	0	10	20% mortality in 7 days	Thamdrup 1935; referenced in O'Conner (unpublished manuscript)
<i>Spisula solidissima</i>	Adult (49-64 mm)	5.3-6.0	11-22	Maximum burrowing rate	Savage 1976
	NR	0.8-1.6	11-22	Reduced burrowing rate, mortality	Savage 1976
	NR	1.6	21.7	1 of 9 dead in 5 days	Savage 1976
	NR	0.9	21.0	3 of 9 dead in 5 days	Savage 1976
	Juvenile/ Adult (31-28mm)	5.7	19-24	Maximum burrowing rate	Savage 1976
	NR	0.9-1.8	17-24	Reduced burrowing rate	Savage 1976
<i>Spisula solidissima</i>	NR	0.9	19	No mortality in 21 days and 30 days (two trials)	Savage 1976
<i>Mulinia lateralis</i>	Juvenile (5 mm)	0	10	LT ₅₀ in 10.5 days without sulfide, 4.3 with sulfide; 644 mg liter ⁻¹ Na ₂ S.9H ₂ O	Shumway and Scott 1983; referenced in O'Conner (unpublished manuscript)
	NR	0	20	LT ₅₀ in 7.5 days	Shumway and Scott 1983; referenced in O'Conner (unpublished manuscript)
	NR	0	30	LT ₅₀ in 2 days	Shumway and Scott 1983; referenced in O'Conner (unpublished manuscript)

Species	Life Stage	Dissolved Oxygen (mg liter ⁻¹)	Temp (°C)	Observed Response	Reference
	Adult (10 mm)	0	10	LT ₅₀ in 10 days without sulfide, 3.8 days with sulfide; 644 mg liter ⁻¹ Na ₂ S·9H ₂ O	Shumway and Scott 1983; referenced in O'Conner (unpublished manuscript)
	NR	0	20	LT ₅₀ in 2.5 days	Shumway and Scott 1983; referenced in O'Conner (unpublished manuscript)
	NR	0	30	LT ₅₀ in 1.8 days	Shumway and Scott 1983; referenced in O'Conner (unpublished manuscript)
	Adult (100 mm)	1.0	10	LC ₅₀ in 15 days; initial mortality in 8 days; total mortality in 30 days	Thurberg and Goodlett 1979
<i>Mulinia lateralis</i>	NR	3.0	10	No mortality in 2 months	Thurberg and Goodlett 1979
	Juvenile/Adult (3.7-5 cm)	1.0	10	LC ₅₀ in 7 days	Thurberg and Goodlett 1979
	Juvenile/Adult (3.8-4.6 cm)	2.0	10	LC ₅₀ in 21 days	Thurberg and Goodlett 1979
Polychaeta					
<i>Capitella capitata</i>	Adult	0	12	Mortality in 8 days	Jacobowa and Malm 1931; referenced in O'Conner (unpublished manuscript)
<i>Capitomastus minimus</i>	Adult	0	12	Mortality in 8 days	Jacobowa and Malm 1931; referenced in O'Conner (unpublished manuscript)
<i>Eteone picta</i>	Adult	0	12	Mortality in 6 days	Jacobowa and Malm 1931; referenced in O'Conner (unpublished manuscript)
<i>Glycera convoluta</i>	Adult	0	12	Mortality in 10 days	Jacobowa and Malm 1931; referenced in O'Conner (unpublished manuscript)

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<i>Harmothae incerta</i>	Adult	0	12	Mortality in 5 days	Jacobowa and Malm 1931; referenced in O'Conner (unpublished manuscript)
<i>Nephtys ciliata</i>	Adult	0	10	LD ₅₀ in 140 hr (5.8 days)	Dries and Theede 1974
<i>Nerevis diversicolor</i>	Adult	0.2	10	LC ₅₀ in 5 days without sulfide, 4 days with sulfide; referenced in O'Conner (unpublished manuscript)	Theede et al. 1969; Theede 1973
	Adult	0	10	LD ₅₀ in 120 hrs (5 days)	Dries and Theede 1974
	Adult	0	6-8	72 hrs with no mortality; ATP conc. 59% of initial value (after 72 hrs)	Schottler 1979
<i>Nereis pelagica</i>	Adult	0	6-8	40% mortality after 36 hrs; ATP conc. 51% of initial value (after 72 hrs)	Schottler 1979
<i>Nereis virens</i>	Adult	0	6-8	72 hrs with no mortality; ATP conc. 57% of initial value (after 72 hrs)	Schottler 1979
<i>Pectinaria neapolitana</i>	Adult	0	12	Mortality in 8 days	Jacobowa and Malm 1931; referenced in O'Conner (unpublished manuscript)
<i>Terebellides stroemi</i>	Adult	0	10	LD ₅₀ in 72 hrs (3 days)	Dries and Theede 1974

Source: Holland et al. 1989.

NR = not reported.

LC₅₀ = lethal concentration at which 50 percent mortality of the test organisms was observed.

LD₅₀ = lethal dose (same as LC₅₀).

LT₅₀ = lethal threshold (same as LC₅₀).

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