

Appendix S1.

The distribution of experiments among habitats and grazer types

Table S1 details the full list of experiments with publication details, location, habitat and the grazers manipulated. Grazer exclusion experiments were concentrated in Europe (245 experiments), North America (167), Australasia (78) and Asia (66), with few experiments in Central America and the Caribbean (19), South America (19), Africa (11), Pacific Islands (7), and Antarctica (1) (Fig 1a). The experiments were also concentrated in temperate regions, with only 19% in the tropics.

Grazer exclusion experiments have been predominantly carried out on intertidal rocky reefs (355 experiments), subtidal rocky reefs (129) and coral reefs (65) with relatively few in seagrass beds (28), subtidal soft sediments (14), salt marsh (12) or intertidal soft sediments (10). Over half of the 615 herbivore exclusion experiments were conducted with molluscs (326 experiments). There were 139 experiments that simultaneously manipulated more than one major herbivore taxon, 61 manipulated urchins, 52 with fishes, and 23 with crustaceans. Very few experiments involved birds (6 experiments), reptiles (3), mammals (2) or polychaetes (1).

Table S1 Publications included in the meta-analysis of grazer impacts on marine benthic vegetation. Each publication is listed with its location, habitat, major taxonomic group of grazers manipulated and the number of experiments (each with independent exclusion and control plots) used in the meta-analysis.

Publication	Location	Habitat	Grazers manipulated	Number of experiments
Aguilera & Navarrete (2007)	Chile	Intertidal rocky reef	Molluscs	1
Albert <i>et al.</i> (2008)	Solomon Islands	Coral reef	Fish	9
Alberti <i>et al.</i> (2007)	Argentina	Salt marsh	Crustaceans	2
Albrecht (1998)	Germany	Intertidal rocky reef	Molluscs	1
Alves <i>et al.</i> (2003)	Madeira Is	Subtidal rocky reef	Urchins	1
Anderson (1995)	Australia	Subtidal rocky reef	Molluscs	2
Anderson (1999)	Australia	Intertidal rocky reef	Molluscs	1
Anderson & Underwood (1997)	Australia	Intertidal rocky reef	Molluscs	3
Andrew & Macdiarmid (1991)	New Zealand	Subtidal rocky reef	Multiple	1
Andrew & Underwood (1993)	Australia	Subtidal rocky reef	Urchins	1

Armitage & Fourqurean (2006)	USA	Seagrass bed	Multiple	1
Arrontes <i>et al.</i> (2004)	Spain	Intertidal rocky reef	Molluscs	8
Balducci <i>et al.</i> (2001)	Italy	Seagrass bed	Multiple	6
Baynes (1999)	Mexico	Subtidal rocky reef	Multiple	2
Bazterrica <i>et al.</i> (2007)	Argentina	Intertidal rocky reef	Molluscs	4
Belliveau & Paul (2002)	Micronesia	Coral reef	Fish	2
Bellwood <i>et al.</i> (2006)	Australia	Coral reef	Fish	1
Benedetti-Cecchi (2000)	Italy	Intertidal rocky reef	Molluscs	7
Benedetti-Cecchi & Cinelli (1992)	Italy	Intertidal rocky reef	Multiple	2
Benedetti-Cecchi & Cinelli (1993)	Italy	Intertidal rocky reef	Molluscs	4
Benedetti-Cecchi & Cinelli (1995)	Italy	Intertidal rocky reef	Urchins	2
Benedetti-Cecchi & Cinelli (1996)	Italy	Intertidal rocky reef	Multiple	6
Benedetti-Cecchi <i>et al.</i> (1996)	Italy	Subtidal rocky reef	Molluscs	2
Benedetti-Cecchi <i>et al.</i> (1998)	Italy	Subtidal rocky reef	Urchins	1
Benedetti-Cecchi <i>et al.</i> (2000)	Italy	Intertidal rocky reef	Molluscs	16
Benedetti-Cecchi <i>et al.</i> (2001)	Italy	Intertidal rocky reef	Molluscs	12
Bertness <i>et al.</i> (1999)	USA,	Intertidal rocky reef	Molluscs	2
Bertness <i>et al.</i> (2006)	Argentina	Intertidal rocky reef	Molluscs	3
Bertness <i>et al.</i> (2009)	USA	Salt marsh	Crustaceans	2
Boaventura <i>et al.</i> (2002)	Portugal, UK	Intertidal rocky reef	Molluscs	4
Brenner <i>et al.</i> (1976)	USA	Salt marsh	Crustaceans	2
Bulleri <i>et al.</i> (1999)	Italy	Subtidal rocky reef	Urchins	6
Bulleri <i>et al.</i> (2000)	Italy	Intertidal rocky reef	Molluscs	8
Bulleri <i>et al.</i> (2002)	Italy	Subtidal rocky reef	Urchins	6
Bulleri <i>et al.</i> (2009)	Italy	Subtidal rocky reef	Urchins	3
Carpenter (1981)	US Virgin Islands	Coral reef	Urchins	1
Carpenter (1986)	US Virgin Islands	Coral reef	Multiple	2
Carter <i>et al.</i> (2007)	USA	Subtidal rocky reef	Urchins	1
Cervin & Åberg (1997)	Sweden	Subtidal rocky reef	Molluscs	3
Cervin <i>et al.</i> (2004)	Sweden	Intertidal rocky reef	Molluscs	1
Cervin <i>et al.</i> (2005)	UK	Intertidal rocky reef	Molluscs	1

Chapman (1990)	Canada	Intertidal rocky reef	Multiple	2
Coen (1988)	Belize	Coral reef	Crustaceans	1
Coleman <i>et al.</i> (2006)	Europe	Intertidal rocky reef	Molluscs	80
Cowen <i>et al.</i> (1982)	USA	Subtidal rocky reef	Urchins	2
Davies <i>et al.</i> (2007)	UK	Intertidal rocky reef	Molluscs	2
Dayton (1971)	USA	Intertidal rocky reef	Molluscs	1
Dethier (1994)	USA	Intertidal rocky reef	Molluscs	1
Dethier & Duggins (1988)	USA	Intertidal rocky reef	Molluscs	4
Diaz-Pulido & McCook (2003)	Australia	Coral reef	Fish	1
Diaz-Pulido <i>et al.</i> (2007)	Colombia	Subtidal rocky reef	Multiple	2
Dudgeon <i>et al.</i> (1999)	USA	Intertidal rocky reef	Molluscs	3
Duffy <i>et al.</i> (1997)	USA	Subtidal soft sediments	Multiple	4
Duggins & Dethier (1985)	USA	Intertidal rocky reef	Molluscs	4
Dungan (1986)	Mexico	Intertidal rocky reef	Molluscs	2
Dunmore & Schiel (2003)	New Zealand	Intertidal rocky reef	Molluscs	2
Dye (1995)	South Africa	Intertidal rocky reef	Molluscs	3
Falace & Bressan (2002)	Italy	Subtidal rocky reef	Urchins	1
Ferreira <i>et al.</i> (1998)	Brazil	Subtidal rocky reef	Fish	1
Fletcher (1987)	Australia	Subtidal rocky reef	Multiple	4
Fong <i>et al.</i> (2000)	Hong Kong	Seagrass bed	Molluscs	1
Foster (1982)	USA	Intertidal rocky reef	Molluscs	1
Freidenburg <i>et al.</i> (2007)	USA	Intertidal rocky reef	Molluscs	19
Gacia <i>et al.</i> (1999)	USA	Seagrass bed	Fish	1
Gaines (1985)	USA	Intertidal rocky reef	Molluscs	2
Geller (1991)	USA	Intertidal rocky reef	Molluscs	7
Gerdol & Hughes (1994)	UK	Intertidal soft sediments	Crustaceans	4
Gobler <i>et al.</i> (2006)	Fiji	Coral reef	Fish	1
Harley (2003)	USA	Intertidal rocky reef	Molluscs	2
Harley (2006)	USA	Intertidal rocky reef	Molluscs	1
Hata & Kato (2003)	Japan	Coral reef	Multiple	2
Hatcher & Larkum (1983)	Australia	Coral reef	Fish	8

Hay & Taylor (1985)	US Virgin Islands	Subtidal rocky reef	Urchins	1
Hill <i>et al.</i> (2003)	Australia	Subtidal rocky reef	Urchins	1
Hillebrand & Kahlert (2001)	Sweden	Subtidal rocky reef	Multiple	4
Hillebrand & Kahlert (2002)	Sweden	Subtidal soft sediments	Multiple	4
Hillebrand <i>et al.</i> (2000)	Germany	Subtidal rocky reef	Multiple	6
Hixon & Brostoff (1996)	Hawaii	Coral reef	Fish	1
Hootsmans <i>et al.</i> (1993)	Mauritania	Seagrass bed	Crustaceans	1
Hori <i>et al.</i> (2006)	Japan	Intertidal rocky reef	Birds	1
Hughes <i>et al.</i> (2000)	UK	Intertidal soft sediments	Polychaetes	1
Hughes <i>et al.</i> (2007)	Australia	Coral reef	Fish	1
Irving & Witman (2009)	Galapagos Islands	Subtidal rocky reef	Urchins	1
Jayewardene (2009)	Hawaii	Coral reef	Fish	3
Jenkins <i>et al.</i> (1999a)	UK	Intertidal rocky reef	Molluscs	2
Jenkins <i>et al.</i> (1999b)	UK	Intertidal rocky reef	Molluscs	2
Jernakoff & Nielsen (1997)	Australia	Seagrass bed	Multiple	1
Johnson (1992)	USA	Intertidal rocky reef	Molluscs	3
Johnson & Mann (1986)	Canada	Intertidal rocky reef	Molluscs	1
Jompa & McCook (2002)	Australia	Coral reef	Fish	2
Kaehler & Froneman (2002)	South Africa	Intertidal rocky reef	Molluscs	1
Kaehler & Williams (1997)	Hong Kong	Intertidal rocky reef	Multiple	26
Keuskamp (2004)	Australia	Seagrass bed	Molluscs	1
Kim (1997)	Canada	Intertidal rocky reef	Molluscs	1
Klumpp <i>et al.</i> (1987)	Australia	Coral reef	Multiple	1
Korpinen & Jormalainen (2008)	Finland	Subtidal rocky reef	Multiple	10
Korpinen <i>et al.</i> (2007)	Finland	Subtidal rocky reef	Multiple	2
Korpinen <i>et al.</i> (2008)	Finland	Subtidal rocky reef	Multiple	3
Lever & Valiela (2005)	USA	Subtidal soft sediments	Multiple	3
Levings & Garrity (1984)	Panama	Intertidal rocky reef	Molluscs	1
Lewis (1986)	Belize	Coral reef	Fish	1
Lindberg <i>et al.</i> (1998)	USA	Intertidal rocky reef	Molluscs	1
Lirman (2001)	USA	Coral reef	Multiple	3

Littler <i>et al.</i> (1995)	Mexico, Honduras	Coral reef	Molluscs	1
Lotze & Worm (2000)	Germany	Subtidal rocky reef	Multiple	1
Lotze <i>et al.</i> (2000)	Germany	Subtidal rocky reef	Multiple	2
Lotze <i>et al.</i> (2001)	Germany, Canada	Subtidal rocky reef	Multiple	5
Lubchenco (1983)	USA	Intertidal rocky reef	Molluscs	3
Lubchenco & Menge (1978)	USA	Intertidal rocky reef	Multiple	6
Lubchenco <i>et al.</i> (1984)	Panama	Intertidal rocky reef	Multiple	2
Macia (2000)	USA	Seagrass bed	Urchins	2
Mak & Williams (1999)	Hong Kong	Intertidal rocky reef	Molluscs	3
Mancinell & Rossi (2001)	Italy	Seagrass bed	Crustaceans	1
Maneveldt & Keats (2008)	South Africa	Intertidal rocky reef	Molluscs	1
Mapstone <i>et al.</i> (2007)	French Polynesia	Coral reef	Urchins	1
Markel & DeWreede (1998)	Canada	Intertidal rocky reef	Molluscs	1
Masini <i>et al.</i> (2001)	Australia	Seagrass bed	Mammals	1
McCall & Rakocinski (2007)	USA	Seagrass bed	Crustaceans	3
McClanahan <i>et al.</i> (1994)	Kenya,	Coral reef	Urchins	2
McClanahan <i>et al.</i> (1996)	Kenya	Coral reef	Urchins	3
McClanahan <i>et al.</i> (2003)	Belize	Coral reef	Fish	1
McCook (1997a)	Australia	Coral reef	Fish	2
McCook (1997b)	Australia	Coral reef	Fish	3
McGlathery (1995)	Bermuda	Seagrass bed	Urchins	2
Menge <i>et al.</i> (1986)	Panama	Intertidal rocky reef	Molluscs	1
Menge <i>et al.</i> (1999)	New Zealand	Intertidal rocky reef	Molluscs	4
Menge <i>et al.</i> (2005)	USA	Intertidal rocky reef	Molluscs	2
Miller & Hay (1996)	USA	Subtidal rocky reef	Multiple	1
Miller & Hay (1998)	USA	Coral reef	Fish	1
Miller <i>et al.</i> (1999)	USA	Coral reef	Fish	1
Morrison (1988)	Jamaica	Coral reef	Urchins	2
Murphy (1984)	USA	Intertidal soft sediments	Crustaceans	2
Nacken & Reise (2000)	Germany	Seagrass bed	Birds	1
Nielsen (2001, 2003)	USA	Intertidal rocky reef	Molluscs	2

Nielsen & Navarrete (2004)	Chile	Intertidal rocky reef	Molluscs	2
Ojeda & Munoz (1999)	Chile	Intertidal rocky reef	Fish	1
Ozolinsh & Kupriyanova (2000)	Russia	Subtidal rocky reef	Urchins	1
Pace (1979)	USA	Intertidal soft sediments	Molluscs	2
Palacin <i>et al.</i> (1998)	Spain	Subtidal rocky reef	Urchins	1
Petraitis (1987)	USA	Intertidal rocky reef	Molluscs	1
Phillips & Hutchison (2008)	New Zealand	Intertidal rocky reef	Molluscs	4
Poore <i>et al.</i> (2009)	Australia	Subtidal rocky reef	Crustaceans	2
Portig <i>et al.</i> (1994)	UK	Seagrass bed	Birds	1
Preen (1995)	Australia	Seagrass bed	Mammals	1
Prince (1995)	Australia	Intertidal rocky reef	Urchins	2
Robertson & Mann (1982)	Canada	Seagrass bed	Molluscs	1
Robles (1982)	USA	Intertidal rocky reef	Multiple	3
Russ (1987)	Australia	Coral reef	Multiple	2
Russ & McCook (1999)	Australia	Coral reef	Fish	2
Russell & Connell (2005)	Australia	Subtidal rocky reef	Molluscs	1
Sala & Boudouresque (1997)	Spain	Subtidal rocky reef	Fish	1
Sammarco (1983)	Australia	Coral reef	Fish	1
Scheibling (1994)	Australia	Subtidal rocky reef	Molluscs	1
Scheibling <i>et al.</i> (2009)	Canada	Subtidal rocky reef	Multiple	14
Schiel (1982)	New Zealand	Subtidal rocky reef	Urchins	1
Sharpe & Keough (1998)	Australia	Intertidal rocky reef	Molluscs	1
Silliman & Bertness (2002)	USA	Salt marsh	Molluscs	2
Silliman & Zieman (2001)	USA	Salt marsh	Molluscs	1
Sjotun <i>et al.</i> (2007)	Norway	Subtidal rocky reef	Multiple	1
Smith <i>et al.</i> (1996)	UK	Intertidal soft sediments	Crustaceans	1
Smith <i>et al.</i> (2001)	Hawaii	Coral reef	Multiple	1
Sotka & Hay (2009)	USA	Coral reef	Multiple	1
Sousa (1979)	USA	Intertidal rocky reef	Multiple	4
Sousa <i>et al.</i> (1981)	USA	Intertidal rocky reef	Urchins	4
Srivastava & Jefferies (1996)	Canada	Salt marsh	Birds	3

Stoner <i>et al.</i> (1995)	Bahamas	Seagrass bed	Molluscs	2
Taylor & Schiel (2010)	New Zealand	Subtidal rocky reef	Fish	5
Thacker <i>et al.</i> (2001)	Guam	Coral reef	Fish	1
Thompson <i>et al.</i> (2004)	UK	Intertidal rocky reef	Molluscs	1
Tomas <i>et al.</i> (2005)	Spain	Seagrass bed	Multiple	2
Toth <i>et al.</i> (2007)	Sweden	Intertidal rocky reef	Molluscs	1
Underwood (1980)	Australia	Intertidal rocky reef	Molluscs	3
Underwood (1984)	Australia	Intertidal rocky reef	Molluscs	1
Underwood (1998)	Australia	Intertidal rocky reef	Molluscs	1
Underwood & Jernakoff (1984)	Australia	Intertidal rocky reef	Molluscs	6
Valentine & Johnson (2005)	Australia	Subtidal rocky reef	Urchins	1
Van Tamelen (1987)	USA	Intertidal rocky reef	Molluscs	1
Vanderklift & Kendrick (2005)	Australia	Subtidal rocky reef	Urchins	3
Viejo <i>et al.</i> (1999)	Sweden	Subtidal rocky reef	Molluscs	4
Vinueza <i>et al.</i> (2006)	Galapagos Islands	Intertidal rocky reef	Reptiles	2
Wai & Williams (2006)	Hong Kong	Intertidal rocky reef	Molluscs	18
Williams (1988)	US Virgin Islands	Seagrass bed	Reptiles	1
Witman (1987)	USA	Subtidal rocky reef	Urchins	1
Wootton <i>et al.</i> (1996)	USA	Intertidal rocky reef	Molluscs	3
Worm & Chapman (1998)	Canada	Intertidal rocky reef	Multiple	1
Worm & Lotze (2006)	Canada, Germany	Intertidal rocky reef	Multiple	23
Worm <i>et al.</i> (2000)	Germany	Subtidal rocky reef	Multiple	1
Worm <i>et al.</i> (2001)	Germany	Subtidal rocky reef	Multiple	2
Worm <i>et al.</i> (2002)	Canada, Germany	Subtidal rocky reef	Multiple	2
Yoneda <i>et al.</i> (2007)	Japan	Subtidal rocky reef	Urchins	1
Zacher <i>et al.</i> (2007)	Antarctica	Intertidal rocky reef	Molluscs	1
Zieman <i>et al.</i> (1984)	US Virgin Islands	Seagrass bed	Urchins	1

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