

Global patterns of macroinvertebrate production in marine benthic habitats

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Appendix 1. References included in the meta-analysis

- Ali MH, Salman SD (1987) Growth and production of the amphipod *Parlyale basrensis* (Talitridae) in the Shatt al-Arab region. *Mar Ecol Prog Ser* 40:231–238
- Ambrogi R (1990) Secondary production of *Prionospio caspersi* (Annelida: Polychaeta: Spionidae). *Mar Biol* 104: 437–442
- Ansell AD, Lagardère F (1980) Observations on the biology of *Donax trunculus* and *D. vittatus* at Ile d'Oléron (French Atlantic Coast). *Mar Biol* 57:287–300
- Ansell AD, Sivadas P, Narayanan B, Trevallion A (1972) The ecology of two sandy beaches in Southwest India. Part 3. Observations on the population of *Donax incarnatus* and *Donax spiculum*. *Mar Biol* 17:318–332
- Asmus H (1982) Field measurements on respiration and secondary production of a benthic community in the northern Wadden sea. *Neth J Sea Res* 16:403–413
- Asmus H (1987) Secondary production of an intertidal mussel bed community related to its storage and turnover compartments. *Mar Ecol Prog Ser* 39:251–266
- Bachelet G (1982) Quelques problèmes liés à l'estimation de la production secondaire. Cas des bivalves *Macoma balthica* et *Scrobicularia plana*. *Oceanol Acta* 5:421–431
- Bachelet G, Yacine-Kassab M (1987) Integration of the postrecruitment phase in the population dynamics of the intertidal gastropod *Hydrobia ulvae* (Pennant). *J Exp Mar Biol Ecol* 111:37–60
- Berry AJ, Othman Zb (1983) An annual cycle of recruitment, growth and production in a Malaysian population of the trochacean gastropod *Umbonium vestiarium* (L.). *Estuar Coast Shelf Sci* 17:357–363
- Berry PF, Smale MJ (1980) An estimate of production and consumption rates in the spiny lobster *Panulirus homarus* on a shallow littoral reef off the Natal coast, South Africa. *Mar Ecol Prog Ser* 2:337–343
- Beukema JJ, Dekker R (1995) Dynamics and growth of a recent invader into European coastal waters: the American razor clam, *Ensis directus*. *J Mar Biol Assoc UK* 75: 351–362
- Beukema JJ, De Vlas J (1979) Population parameters of the lugworm, *Arenicola marina*, living on tidal flats in the Dutch Wadden Sea, Netherlands. *Neth J Sea Res* 13: 331–353
- Blankley WO, Branch GM (1985) Ecology of the limpet *Nacella delesserti* at Marion Island in the sub-Antarctic Southern Ocean. *J Exp Mar Biol Ecol* 92:259–282
- Brey T, Hain S (1992) Growth, reproduction and production of *Lissarca notorcadensis* (Bivalvia: Philobryidae) in the Weddell Sea, Antarctica. *Mar Ecol Prog Ser* 82:219–226
- Brey T, Arntz WE, Pauly D, Rumohr H (1990) *Arctica islandica* in Kiel Bay (Western Baltic): growth, production and ecological significance. *J Exp Mar Biol Ecol* 136:217–236
- Brey T, Pearce J, Basch L, McClintock J, Slattery M (1995a) Growth and production of *Sterechinus neumayeri* (Echinoidea: Echinodermata) in McMurdo Sound, Antarctica. *Mar Biol* 124:279–292
- Brey T, Peck LS, Gutt J, Hain S, Arntz WE (1995b) Population dynamics of *Magellania fragilis*, a brachiopod dominating a mixed-bottom macrobenthic assemblage on the Antarctic shelf. *J Mar Biol Assoc UK* 75:857–869
- Brey T, Gutt J, Mackensen A, Starmans A (1998) Growth and productivity of the high Antarctic bryozoan *Melicerita obliqua*. *Mar Biol* 132:327–333
- Britton RH (1985) Life cycle and production of *Hydrobia acuta* Drap. (Gastropoda: Prosobranchia) in a hypersaline coastal lagoon. *Hydrobiologia* 122:219–230
- Broom MJ (1983) Mortality and production in natural, artificially-seeded and experimental populations of *Anadara granosa* (Bivalvia: Arcidae). *Oecologia* 58:389–397
- Buchanan JB, Warwick RM (1974) An estimate of benthic macrofaunal production in the offshore mud of the Northumberland Coast. *J Mar Biol Assoc UK* 54:197–222
- Burke MC, Mann KH (1974) Productivity and production: biomass ratio of bivalve and gastropod populations in an eastern Canadian estuary. *J Fish Res Board Can* 31: 167–177
- Cardoso RS, Veloso VG (1996) Population biology and secondary production of the sandhopper *Pseudorchestoides brasiliensis* (Amphipoda: Talitridae) at Prainha Beach, Brazil. *Mar Ecol Prog Ser* 142:111–119
- Cartes JE, Sorbe JC (1999) Estimating secondary production in bathyal suprabenthic peracarid crustaceans from the Catalan Sea slope (western Mediterranean: 391–1255 m). *J Exp Mar Biol Ecol* 239:195–210
- Ceccherelli VU, Rossi R (1984) Settlement, growth and production of the mussel, *Mytilus galloprovincialis*. *Mar Ecol Prog Ser* 16:173–184
- Cederwall H, Jermakovs V (1999) Growth and production of three macrozoobenthic species in the Gulf of Riga, including comparisons with other areas. *Hydrobiologia* 393: 201–210
- Chambers MR, Milne H (1975a) Life cycle and production of *Nereis diversicolor* O. F. Müller in the Ythan Estuary, Scotland. *Estuar Coast Mar Sci* 3:133–144
- Chambers MR, Milne H (1975b) The production of *Macoma balthica* (L.) in the Ythan estuary. *Estuar Coast Mar Sci* 3: 443–455

Appendix 1 (continued)

- Chardy P, Guillaumont B, Hamon D (1984) Population dynamics of *Nucula nucleus* (Bivalvia, Protobranchiata) in the Cap of Flamanville (Manche) (France). *Oceanol Acta* 7:103–112
- Cheung SG (1993) Population dynamics and energy budgets of green-lipped mussel *Perna viridis* (Linnaeus) in a polluted harbour. *J Exp Mar Biol Ecol* 168:1–24
- Claereboudt MR, Himmelman JH (1996) Recruitment, growth and production of giant scallops (*Placopentem magellanicus*) along an environmental gradient in Baie des Chaleurs, eastern Canada. *Mar Biol* 124:661–670
- Clasing E, Brey T, Stead R, Navarro J, Asencio G (1994) Population dynamics of *Venus antiqua* (Bivalvia: Veneracea) in the Bahía de Yaldad, Isla de Chiloe, southern Chile. *J Exp Mar Biol Ecol* 177:171–186
- Collie JS (1985) Life history and production of three amphipod species on Georges Bank (Atlantic Ocean). *Mar Ecol Prog Ser* 22:229–238
- Collie JS (1987) Food consumption by yellowtail flounder in relation to production of its benthic prey. *Mar Ecol Prog Ser* 36:205–213
- Coma R, Ribes M, Zabala M, Gili JM (1998) Growth in a modular colonial marine invertebrate. *Estuar Coast Shelf Sci* 47:459–470
- Cornet M (1986) Estimates of annual production of *Abra alba* (Mollusca, Bivalvia) populations on the southern Bay of Biscay (France) continental shelf. *Oceanol Acta* 9:323–332
- Covi MP, Kneib RT (1995) Intertidal distribution, population dynamics and production of the amphipod *Uthlorchestia spartinophila* in a Georgia, USA, salt marsh. *Mar Biol* 121:447–455
- Craeymeersch JA, Herman PMJ, Meire PM (1986) Secondary production of an intertidal mussel (*Mytilus edulis* L.) population in the eastern Scheldt (S.W. Netherlands). *Hydrobiologia* 133:107–115
- Cranford PJ, Peer DL, Gordon DC (1985) Population dynamics and production of *Macoma balthica* in Cumberland basin and Shepody Bay, Bay of Fundy (Canada). *Neth J Sea Res* 19:135–146
- Dahm C (1993) Growth, production and ecological significance of *Ophiura albida* and *Ophiura ophiura* (Echinodermata: Ophiuroidea) in the German bight. *Mar Biol* 116:431–437
- Dame RF (1976) Energy flow in an intertidal oyster population. *Estuar Coast Mar Sci* 4:243–253
- Dauvin JC (1985) Dynamics and production of a population of *Venus ovata* (Mollusca, Bivalvia) in the Bay or Morlaix (western English Channel). *J Exp Mar Biol Ecol* 91:109–124
- Dauvin JC (1986) Biologie, dynamique et production d'une population d'*Abra alba* (Wood) (Mollusque-Bivalve) de la baie de Morlaix (Manche Occidentale). *J Exp Mar Biol Ecol* 97:151–180
- Dauvin JC (1988a) Biology, dynamics and production of populations of crustacean amphipods in the western English Channel: 1. *Ampelisca tenuicornis* Liljeborg. *J Exp Mar Biol Ecol* 118:55–84
- Dauvin JC (1988b) Biology and population dynamics and production of Crustacea Amphipoda from the western English Channel: 2. *Ampelisca brevicornis* (Costa). *J Exp Mar Biol Ecol* 119:213–233
- Dauvin JC (1988c) Biology and population dynamics and production of Crustacea Amphipoda from the western English Channel: 3. *Ampelisca typica* (Bate). *J Exp Mar Biol Ecol* 121:1–22
- Dauvin JC (1988d) Life cycle, dynamics, and productivity of Crustacea-Amphipoda from the western English Channel: 4. *Ampelisca armoricana* Bellan-Santini et Dauvin. *J Exp Mar Biol Ecol* 123:235–252
- Dauvin JC (1989) Life cycle, dynamics and productivity of Crustacea-Amphipoda from the western English Channel: 5. *Ampelisca sarsi* Chevreux. *J Exp Mar Biol Ecol* 128:31–56
- Deslous-Paoli JM (1985) *Crepidula fornicata* L. (Gastéropodes) dans le bassin de Marennes-Oleron: structure, dynamique et production d'une population. *Oceanol Acta* 8:453–460
- De Vlas J (1985) Secondary production by siphon regeneration in a tidal flat population of *Macoma balthica*. *Neth J Sea Res* 19:147–164
- Donn TEJ, Croker RA (1986) Seasonal patterns of production in the sandy-beach amphipod *Haustorius canadensis*. *Estuar Coast Shelf Sci* 22:675–688
- Drake P, Arias AM (1995) Distribution and production of *Chironomus salinarius* (Diptera: Chironomidae) in a shallow coastal lagoon in the Bay of Cadiz. *Hydrobiologia* 299:195–206
- Edwards SF, Welsh BL (1982) Trophic dynamics of a mud snail [*Ilyanassa obsoleta* (Say)] population on an intertidal mudflat. *Estuar Coast Shelf Sci* 14:663–686
- Fenton GE (1996) Production and biomass of *Tenagomysis tasmaniae* Fenton, *Anisomysis mixta australis* (Zimmer) and *Paramesopodopsis rufa* Fenton from south-eastern Tasmania (Crustacea: Mysidacea). *Hydrobiologia* 323:23–30
- George CL, Warwick RM (1985) Annual macrofauna production in a hard-bottom reef community. *J Mar Biol Assoc UK* 65:713–735
- Gillet P (1990) Biomasse, production et dynamique des populations de *Nereis diversicolor* (annélide polychète) de l'estuaire de la Loire (France). *Oceanol Acta* 13:361–372
- Gorny M, Brey T, Arntz W, Bruns T (1993) Growth, development and productivity of *Chorismus antarcticus* (Pfeffer) (Crustacea: Decapoda: Natantia) in the eastern Weddell Sea, Antarctica. *J Exp Mar Biol Ecol* 174:261–275
- Greenwood PJ (1980) Growth, respiration and tentative energy budgets for 2 populations of the sea urchin *Parechinus angulosus* (Leske). *Estuar Coast Mar Sci* 10:347–468
- Griffiths RJ (1981) Production and energy flow in relation to age and shore level in the bivalve *Choromytilus meridionalis* (Kr.). *Estuar Coast Shelf Sci* 13:477–493
- Hasting MH (1981) The life cycle and productivity of an intertidal population of the amphipod *Ampelisca brevicornis*. *Estuar Coast Shelf Sci* 12:665–677
- Hawkins CM, Lewis JB (1982) Ecological energetics of the tropical sea urchin *Diadema antillarum* Phillipi in Barbados, West Indies. *Estuar Coast Shelf Sci* 15:645–669
- Heip C, Herman R (1979) Production of *Nereis diversicolor* O. F. Müller (Polychaeta) in a shallow brackish-water pond. *Estuar Coast Mar Sci* 8:297–305
- Hibbert CJ (1976) Biomass and production of a bivalve community on an intertidal mud-flat. *J Exp Mar Biol Ecol* 25:249–261
- Hibbert CJ (1977) Energy relations of the bivalve *Mercenaria mercenaria* on an intertidal mudflat. *Mar Biol* 44:77–84
- Howe S, Maurer D, Leathem W (1988) Secondary production of benthic molluscs from the Delaware Bay and coastal area. *Estuar Coast Shelf Sci* 26:81–94
- Huebner JD, Edwards DC (1981) Energy budget of the predatory marine gastropod *Polinices duplicatus*. *Mar Biol* 61:221–226
- Hughes RG (1978) Production and survivorship of epizoites of the Hydroid *Nemertesia antennina* (L.). *J Mar Biol Assoc UK* 58:333–345

Appendix 1 (continued)

- Hughes RN (1971a) Ecological energetics of *Nerita* (Archaeogastropoda, Neritacea) populations on Barbados, West Indies. *Mar Biol* 11:12–22
- Hughes RN (1971b) Ecological energetics of the keyhole limpet *Fissurella barbadensis* Gmelin. *J Exp Mar Biol Ecol* 6:167–178
- Hughes RN (1972) Annual production of two Nova Scotian populations of *Nucella Lapilus* (L.). *Oecologia* 8:356–370
- Hummel H (1985) An energy budget for a *Macoma balthica* (Mollusca) population living on a tidal flat in the Dutch Wadden sea. *Neth J Sea Res* 19:84–92
- Jackson D, Mason CF, Long SP (1985) Macro-invertebrate populations and production on a salt-marsh in east England (UK) dominated by *Spartina anglica*. *Oecologia* 65:406–411
- Jensen JN (1991) Increased abundance and growth of the suspension-feeding bivalve *Corbula gibba* in a shallow part of the eutrophic Limfjord, Denmark. *Neth J Sea Res* 27:101–108
- Johnson WS (1976) Population energetics of the intertidal isopod *Cirolana harfordi*. *Mar Biol* 36:351–357
- Josefson AB (1982) Regulation of population size, growth and production of a deposit-feeding bivalve: a long-term field study of three deep-water populations off the Swedish west coast. *J Exp Mar Biol Ecol* 59:125–150
- Kemp PF (1988) Production and life history of a deposit-feeding polychaete in an atypical environment. *Estuar Coast Shelf Sci* 26:437–446
- Koop K, Field JG (1981) Energy transformation by the supralittoral isopod, *Ligia dilatata*. *J Exp Mar Biol Ecol* 53:221–234
- Kuipers BR, Dapper R (1981) Production of *Crangon crangon* in the tidal zone of the Dutch Wadden sea. *Neth J Sea Res* 15:33–53
- LaFrance K, Ruber E (1985) The life cycle and productivity of the amphipod *Gammarus mucronatus* on a northern Massachusetts (USA) salt marsh. *Limnol Oceanogr* 30:1067–1077
- Lambeck RHD, Valentijn P (1987) Distribution, dynamics and productivity of a colonizing *Polydora quadrilobata* and an established (*Polydora ligni*) polydorid polychaete in Lake Grevelingen: an enclosed estuary in the Southwest Netherlands. *Neth J Sea Res* 21:143–158
- Lewis JB, Saleh S, Reisinger HM, Lalli CM (1982) Growth, production and biomass of the burrowing protobranch Mollusc *Yoldia limatula* in the Bisford river, Prince Edward Island, Canada. *Mar Biol* 70:173–179
- Loo LO, Rosenberg R (1989) Bivalve suspension-feeding dynamics and benthic-pelagic coupling in an eutrophicated marine bay. *J Exp Mar Biol Ecol* 130:253–276
- MacDonald BA, Thompson RJ (1986) Production, dynamics and energy partitioning in 2 populations of the giant scallop *Placopecten magellanicus*. *J Exp Mar Biol Ecol* 101:285–299
- Maslin JL, Pattee E (1989) The production of *Corbula trigona* (Bivalvia) in relation to its demographic strategies in a West African lagoon. *Oikos* 55:194–204
- Medernach L, Grémare A (1999) Comparaison de méthodes d'évaluation de la production secondaire d'une population de l'annélide polychète *Ditropa arietina* (O. F. Muller). *Oceanol Acta* 22:337–352
- Mees J, Abdulkarim Z, Hamerlynck O (1994) Life history, growth and production of *Neomysis integer* in the Westerschelde estuary (SW Netherlands). *Mar Ecol Prog Ser* 109:43–57
- Ménard F, Gentil F, Dauvin JC (1989) Population dynamics and secondary production of *Owenia fusiformis* Delle Chiaje (Polychaeta) from the Bay of Seine (eastern English Channel) (France). *J Exp Mar Biol Ecol* 133:151–168
- Méndez N, Romero J, Flos J (1997) Population dynamics and production of the polychaete *Capitella capitata* in the littoral zone of Barcelona (Spain, NW Mediterranean). *J Exp Mar Biol Ecol* 218:263–284
- Miller RJ, Mann KH (1973) Ecological energetics of the seaweed zone in a marine bay on the Atlantic coast of Canada. Part 3. Energy transformation by sea-urchins. *Mar Biol* 18:99–114
- Mistri M, Ceccherelli VU (1994) Growth and secondary production of the mediterranean gorgonian *Paramuricea clavata*. *Mar Ecol Prog Ser* 103:291–296
- Mitchell ND, Dardeau MR, Schroeder WW, Benke AC (1992) Secondary production of gorgonian corals in the northern Gulf of Mexico. *Mar Ecol Prog Ser* 87:275–281
- Moller P, Rosenberg R (1982) Production and abundance of the amphipod *Corophium volutator* on the West coast of Sweden. *Neth J Sea Res* 16:127–140
- Nakaoka M (1992) Spatial and seasonal variation in growth rate and secondary production of *Yoldia notabilis* in Otsuchi Bay, Japan, with reference to the influence of food supply from the water column. *Mar Ecol Prog Ser* 88:215–223
- Nichols FH (1975) Dynamics and energetics of three deposit-feeding benthic invertebrate populations in Puget sound, Washington. *Ecol Monogr* 45:57–82
- Nicolaidou A (1983) Life history and productivity of *Pectinaria koreni* Malmgren (Polychaeta). *Estuar Coast Shelf Sci* 17:31–43
- Nithart M (1998) Population dynamics and secondary production of *Nereis diversicolor* in a North Norfolk Saltmarsh (UK). *J Mar Biol Assoc UK* 78:131–143
- Nithart M, Alliot E, Salen PC (1999) Production, respiration and ammonia excretion of two polychaete species in a north Norfolk saltmarsh. *J Mar Biol Assoc UK* 79:1029–1037
- Noda T (1997) Temporal changes in secondary production of a population of the subtidal snail *Umbonium costatum* in Hakodate Bay, northern Japan: importance of annual change in age structure. *J Sea Res* 37:145–152
- Olafsson EB, Persson LE (1986) Distribution, life cycle and demography in a brackish water population of the isopod *Cyathura carinata* (Kroyer) (Crustacea). *Estuar Coast Shelf Sci* 23:673–688
- Oyeneke JA (1986) Population dynamics and secondary production in an estuarine population of *Nephtys hombergii* (Polychaeta: Nephtyidae). *Mar Biol* 93:217–224
- Oyeneke JA (1987) Population dynamics and secondary production in an estuarine population of *Cauterella capute-socis* (Polychaeta: Cirratulidae). *Mar Biol* 95:267–274
- Oyeneke JA (1988) Population dynamics and secondary production in *Melinna palmata* (Polychaeta: Ampharetidae). *Mar Biol* 98:247–252
- Paine RT (1971) Energy flow in a natural population of the herbivorous gastropod *Tegula funebris*. *Limnol Oceanogr* 16:86–98
- Peer DL (1970) Relation between biomass, productivity, and loss to predators in a population of a marine benthic polychaete, *Pectinaria hyperborea*. *J Fish Res Board Can* 27:2143–2153
- Picken GB (1979) Growth, production and biomass of the Antarctic gastropod *Laevilacunaria antarctica*. *J Exp Mar Biol Ecol* 40:71–79
- Picken GB (1980) The distribution, growth and reproduction of the antarctic limpet *Nacella concinna*. *J Exp Mar Biol Ecol* 42:71–86

Appendix 1 (continued)

- Pihl L, Rosenberg R (1982) Production, abundance and biomass of mobile epibenthic marine fauna in shallow waters, western Sweden. *J Exp Mar Biol Ecol* 57:273–301
- Price R, Warwick RM (1980) Temporal variations in annual production and biomass in estuarine populations of two polychaetes, *Nephtys hombergi* and *Ampharete acutifrons*. *J Mar Biol Assoc UK* 60:481–487
- Rachor E, Arntz WE, Rumohr H, Mantau KH (1982) Seasonal and long-term population fluctuations in *Diastylis rathkei* (Crustacea: Cumacea) of Kiel Bay and German Bight. *Neth J Sea Res* 16:141–150
- Rainer SF (1985) Population dynamics and production of the bivalve *Abra alba* and implications for fisheries production. *Mar Biol* 85:253–262
- Rainer SF, Wadley VA (1991) Abundance, growth and production of the bivalve *Solemya* sp., a food source for juvenile rock lobsters in a seagrass community in western Australia. *J Exp Mar Biol Ecol* 152:201–224
- Santos PJP (1994) Population dynamics and production of *Scolelepis gaucha* (Polychaeta: Spionidae) on the sandy beaches of southern Brazil. *Mar Ecol Prog Ser* 110:159–165
- Sarda R, Martin D (1993) Populations of *Streblospio* (Polychaeta: Spionidae) in temperature zones: demography and production. *J Mar Biol Assoc UK* 73:769–784
- Sarda R, Foreman K, Valiela I (1995a) Macroinfauna of a southern new England salt marsh: seasonal dynamics and production. *Mar Biol* 121:431–445
- Sarda R, Valiela I, Foreman K (1995b) Life cycle, demography, and production of *Marenzelleria viridis* in a salt marsh of southern New England. *J Mar Biol Assoc UK* 75:725–738
- Seitz RD, Schaffner LC (1995) Population ecology and secondary production of the polychaete *Loimia meduca* (Terebellidae). *Mar Biol* 121:701–711
- Shafee MS (1992) Production estimate of a mussel population *Perna picta* (Born) on the Atlantic coast of Morocco. *J Exp Mar Biol Ecol* 163:183–197
- Shafee MS, Conan G (1984) Energetic parameters of a population of *Chlamys varia* (Bivalvia: Pectinidae). *Mar Ecol Prog Ser* 18:253–262
- Sheader M (1977) Production and population dynamics of *Ampelisca tenuicornis* (Amphipoda) with notes on the biology of its parasite *Sphaeronella longipes* (Copepoda). *J Mar Biol Assoc UK* 57:955–968
- Siegismund HR (1982) Life cycle and production of *Hydrobia ventrosa* and *Hydrobia neglecta* (Mollusca: Prosobranchia). *Mar Ecol Prog Ser* 7:75–82
- Sköld M, Loo LO, Rosenberg R (1994) Production, dynamics and demography of an *Amphiura filiformis* population. *Mar Ecol Prog Ser* 103:81–90
- Sola JC (1996) Population dynamics, reproduction, growth, and secondary production of the mud-snail *Hydrobia ulvae* (Pennant). *J Exp Mar Biol Ecol* 205:49–62
- Sprung M (1994) Macrobenthic secondary production in the intertidal zone of the Ria Formosa: a lagoon in southern Portugal. *Estuar Coast Shelf Sci* 38:539–558
- Stanhope MJ, Levings CD (1985) Growth and production of *Eogammarus confervicolus* (Amphipoda: Anisogammaridae) at a log storage site and in areas of undisturbed habitat within the Squamish estuary, British Columbia. *Can J Fish Aquat Sci* 42:1733–1740
- Stokes MD (1996) Larval settlement, post-settlement growth and secondary production of the Florida lancelet (=amphioxus) *Branchiostoma floridae*. *Mar Ecol Prog Ser* 130:71–84
- Sudo H, Azeta M (1996) Life history and production of the amphipod *Byblis japonicus* Dahl (Gammaridea: Ampeliscidae) in a warm temperate zone habitat, Shijiki Bay, Japan. *J Exp Mar Biol Ecol* 198:203–222
- Sutherland JP (1972) Energetics of high and low populations of the limpet, *Acmaea scabra* (Gould). *Ecology* 53:430–437
- Thompson RJ (1984) Production, reproductive effort, reproductive value and reproductive cost in a population of the blue mussel *Mytilus edulis* from a subarctic environment. *Mar Ecol Prog Ser* 16:249–257
- Trevallion A (1971) Studies on *Tellina tenuis* (Da Costa). III. Aspect of general biology and energy flow. *J Exp Mar Biol Ecol* 7:95–122
- Urban HJ, Campos B (1994) Population dynamics of the bivalves *Gari solida*, *Semele solida* and *Protothaca thaca* from a small bay in Chile at 36° S. *Mar Ecol Prog Ser* 115:93–102
- Vahl O (1981) Energy transformations by the Iceland scallop, *Chlamys islandica*, from 70°N: 2. The population energy budget. *J Exp Mar Biol Ecol* 53:297–304
- Valderhaug VA (1985) Population structure and production of *Lumbrineris fragilis* (Polychaeta: Lumbrineridae) in the Oslofjord (Norway) with a note on metal content of jaws. *Mar Biol* 86:203–212
- Vetter EW (1995) Detritus-based patches of high secondary production in the nearshore benthos. *Mar Ecol Prog Ser* 120:251–262
- Vetter EW (1996) Secondary production of a Southern California *Nebalia* (Crustacea: Leptostraca). *Mar Ecol Prog Ser* 137:95–101
- Vetter EW (1998) Population dynamics of a dense assemblage of marine detritivores. *J Exp Mar Biol Ecol* 226:131–161
- Warwick RM, Price R (1975) Macrofauna production in an estuarine mud-flat. *J Mar Biol Assoc UK* 55:1–18
- Warwick RM, George CL, Davies JR (1978) Annual macrofauna production in a *Venus* community. *Estuar Coast Mar Sci* 7:215–241
- Weinbauer MG, Velimirov B (1995) Biomass and secondary production of the temperate gorgonian coral *Eunicella cavolini* (Coelenterata: Octocorallia). *Mar Ecol Prog Ser* 121:211–216
- Wildish DJ, Peer D (1981) Methods for estimating secondary production in marine Amphipoda. *Can J Fish Aquat Sci* 38:1019–1026
- Willows RI (1987) Population and individual energetics of *Ligia oceanica* (L.) (Crustacea: Isopoda) in the rocky supralittoral. *J Exp Mar Biol Ecol* 105:253–274
- Wilson JG (1999) Population dynamics and energy budget for a population of *Donax variabilis* (Say) on an exposed South Carolina beach. *J Exp Mar Biol Ecol* 239:61–83
- Wolff WJ, de Wolf LH (1977) Biomass and production of zoobenthos in the Grevelingen estuary, The Netherlands. *Estuar Coast Mar Sci* 5:1–24
- Wolff WJ, Gueye A, Meijboom A, Piersma T, Sall MA (1987) Distribution, biomass, recruitment and productivity of *Anadara senilis* (L.) (Mollusca: Bivalvia) on the Banc D'Arguin, Mauritania. *Neth J Sea Res* 21:243–253
- Wooldridge TH (1986) Distribution, population dynamics and estimates of production for the estuarine mysid, *Rhopalophthalmus terranatalis*. *Estuar Coast Shelf Sci* 23:205–224
- Workman C (1983) Comparisons of energy partitioning in contrasting age-structured populations of the limpet *Patella vulgata* L. *J Exp Mar Biol Ecol* 68:81–103
- Wright JR, Hartnoll RG (1981) An energy budget for a population of the limpet *Patella vulgata*. *J Mar Biol Assoc UK* 61:627–646
- Wu RSS, Levings CD (1979) Energy flow and population dynamics of the barnacle *Balanus glandula*. *Mar Biol* 54:83–89