

## Supplementary Material 2.2

### References – Trait categorisation

- 1) Information from taxonomists
- 2) Information from collected specimens
- 3) Information from images
- 4) Jumars, P. A., Dorgan, K. M., and Lindsay, S. M. (2015). Diet of worms emended: an update of polychaete feeding guilds. *Ann. Rev. Mar. Sci.* 7, 497–520.
- 5) Faulwetter, S., Markantonatou, V., Pavloudi, C., Papageorgiou, N., Keklikoglou, K., Chatzinikolaou, E., et al. (2014). Polytraits: a database on biological traits of marine polychaetes. *Biodivers. Data J.* 2, 1–41. doi:10.3897/BDJ.2.e1024.
- 6) Capa, M., and Murray, A. (2015). Integrative taxonomy of *Parasabella* and *Sabellomma* (Sabellidae: Annelida) from Australia: description of new species, indication of cryptic diversity, and translocation of some species out of their natural distribution range. *Zool. J. Linn. Soc.* 175, 764–811. doi:10.1111/zoj.12308.
- 7) Capa, M., Hutchings, P., Teresa Aguado, M., and Bott, N. J. (2011). Phylogeny of Sabellidae (Annelida) and relationships with other taxa inferred from morphology and multiple genes. *Cladistics* 27, 449–469. doi:10.1111/j.1096-0031.2010.00341.x.
- 8) Rouse, G. W., and Fauchald, K. (1997). Cladistics and polychaetes. *Zool. Scr.* 26, 139–204.
- 9) Andrade, C., Ríos, C., Gerdes, D., and Brey, T. (2016). Trophic structure of shallow-water benthic communities in the sub-Antarctic Strait of Magellan. *Polar Biol.* 39, 2281–2297. doi:10.1007/s00300-016-1895-0.
- 10) Duchêne, J. C. (1992). “A model of spawn periodicity and population dynamics of *Thelepus extensus* (Hutchings) (Annelida: Polychaeta) in Kerguelen” in *Marine Eutrophication and Population Dynamics: 25th European Marine Biology Symposium, Institute of Zoology, University of Ferrara*, 231.
- 11) McHugh, D. (1993). A comparative study of reproduction and development in the polychaete family Terebellidae. *Biol. Bull.* 185, 153–167. doi:10.2307/1541996.

- 12)** Diez, M. J., and Lovrich, G. A. (2010). Reproductive biology of the crab *Halicarcinus planatus* (Brachyura, Hymenosomatidae) in sub-Antarctic waters. *Polar Biol.* 33, 389–401. doi:10.1007/s00300-009-0716-0.
- 13)** Richardson, J. R. (1997). *Ecology of articulated brachiopods.*
- 14)** Petersen, J. K. (2007). Ascidian suspension feeding. *J. Exp. Mar. Bio. Ecol.* 342, 127–137. doi:10.1016/j.jembe.2006.10.023.
- 15)** Conlan, K. E., Rau, G. H., and Kvittek, R. G. (2006).  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  shifts in benthic invertebrates exposed to sewage from McMurdo Station, Antarctica. *Mar. Pollut. Bull.* 52, 1695–1707. doi:10.1016/j.marpolbul.2006.06.010.
- 16)** Teixidó, N., Garrabou, J., and Harmelin, J. G. (2011). Low dynamics, high longevity and persistence of sessile structural species dwelling on mediterranean coralligenous outcrops. *PLoS One* 6. doi:10.1371/journal.pone.0023744.
- 17)** Kahng, S. E., Benayahu, Y., and Lasker, H. R. (2011). Sexual reproduction in octocorals. *Mar. Ecol. Prog. Ser.* 443, 265–283. doi:10.3354/meps09414.
- 18)** Edwards, D. C. B., and Moore, C. G. (2009). Reproduction in the sea pen *Funiculina quadrangularis* (Anthozoa: Pennatulacea) from the west coast of Scotland. *Estuar. Coast. Shelf Sci.* 82, 161–168. doi:10.1016/j.ecss.2009.01.006.
- 19)** Hughes, R. G. (1983). The life-history of *Tubularia indivisa* (Hydrozoa: Tubulariidae) with observations on the status of *T. ceratogyne*. *J. Mar. Biol. Assoc. United Kingdom* 63, 467–479. doi:10.1017/S0025315400070806.
- 20)** Laptikhovskiy, V., Brickle, P., Söffker, M., Davidson, D., Roux, M. J., Rexer-Huber, K., et al. (2015). Life history and population characteristics of the Antarctic starfish, *Anasterias antarctica* Lütken, 1856 (Asteroidea: Forcipulatida: Asteriidae) around the Falkland Islands. *Polar Biol.* 38, 463–474. doi:10.1007/s00300-014-1608-5.
- 21)** Fraysse, C. P., Boy, C. C., and Pérez, A. F. (2021). Reproductive traits of the intertidal sea star *Anasterias antarctica* (Echinodermata: Asteroidea) from the Beagle Channel, Argentina. *Mar. Biol.* 168, 1–19. doi:10.1007/s00227-021-03987-9.
- 22)** Fernanda, P. A., Clementina, B. C., Javier, C., and Gabriela, M. (2015). Reproduction and oxidative metabolism in the brooding sea star *Anasterias antarctica* (Lütken, 1957). *J. Exp. Mar. Bio. Ecol.* 463, 150–157. doi:10.1016/j.jembe.2014.11.009.

- 23)** McClintock, J. B. (1994). Trophic biology of Antarctic shallow-water echinoderms. *Mar. Ecol. Prog. Ser.* 111, 191–202. doi:10.3354/meps111191.
- 24)** Le Bourg, B., Saucède, T., Charpentier, A., Lepoint, G., and Michel, L. N. (2022). What is the menu today in a subantarctic kelp food web from the Kerguelen Islands? Phytodetritus, phytoplankton and phytobenthos; not living kelp. *Mar. Biol.* 169, 1–16. doi:10.1007/s00227-022-04105-z.
- 25)** Bosch, I., and Pearse, J. S. (1990). Developmental types of shallow-water asteroids of McMurdo Sound, Antarctica. *Mar. Biol.* 104, 41–46. doi:10.1007/BF01313155.
- 26)** McEdward, L. R., and Morgan, K. H. (2001). Interspecific relationships between egg size and the level of parental investment per offspring in echinoderms. *Biol. Bull.* 200, 33–50. doi:10.2307/1543083.
- 27)** Le Bourg, B. (2020). Trophic ecology of Southern Ocean sea stars: influence of environmental drivers on trophic diversity.
- 28)** Bosch, I. (1989). Contrasting modes of reproduction in two Antarctic asteroids of the genus *Porania*, with a description of unusual feeding and non-feeding larval types. *Biol. Bull.* 177, 77–82. doi:10.2307/1541836.
- 29)** McClintock, J. B., and Vernon, J. D. (1990). Chemical defense in the eggs and embryos of antarctic sea stars (Echinodermata). *Mar. Biol.* 105, 491–495. doi:https://doi.org/10.1007/BF01316320.
- 30)** Benítez-Villalobos, F., Díaz-Martínez, J. P., and Tyler, P. A. (2007). Reproductive biology of the deep-sea asteroid *Henricia abyssicola* from the NE Atlantic Ocean. *Ciencias Mar.* 33, 49–58. doi:10.7773/cm.v33i1.329.
- 31)** McClintock, J. B., Amsler, C. D., Baker, B. J., and van Soest, R. W. M. (2005). Ecology of Antarctic marine sponges: an overview. *Integr. Comp. Biol.* 45, 359–368. doi:10.1093/icb/45.2.359.
- 32)** Slattery, M., and Bosch, I. (1993). Mating behavior of a brooding Antarctic asteroid, *Neosmilaster georgianus*. *Invertebr. Reprod. Dev.* 24, 97–102. doi:10.1080/07924259.1993.9672338.
- 33)** Stanwell-Smith, D., and Clarke, A. (1998). Seasonality of reproduction in the cushion star *Odontaster validus* at Signy Island, Antarctica. *Mar. Biol.* 131, 479–487. doi:10.1007/s002270050339.

- 34)** Peck, L. S., Webb, K. E., Miller, A., Clark, M. S., and Hill, T. (2008). Temperature limits to activity, feeding and metabolism in the Antarctic starfish *Odontaster validus*. *Mar. Ecol. Prog. Ser.* 358, 181–189. doi:10.3354/meps07336.
- 35)** Komatsu, M., O’Loughlin, P. M., Bruce, B., Yoshizawa, H., Tanaka, K., and Murakami, C. (2006). A gastric-brooding asteroid, *Smilasterias multipara*. *Zoolog. Sci.* 23, 699–705. doi:10.2108/zsj.23.699.
- 36)** Tyler, P. A., and Gage, J. D. (1980). Reproduction and growth of the deep-sea brittlestar *Ophiura ljunghmani* (Lyman). *Oceanol. Acta* 3, 177–185.
- 37)** Gutt, J. (1991). On the distribution and ecology of holothurians in the Weddell Sea (Antarctica). *Polar Biol.* 11, 145–155. doi:10.1007/BF00240203.
- 38)** Bohn, J. M., and Heß, M. (2014). The Antarctic holothurian genus *Echinopsolus* Gutt, 1990 (Dendrochirotida, Cucumariidae): brood pouches, spermatozoa, spermatozeugmata and taxonomic implications. *Zootaxa* 3841, 573–591. doi:10.11646/zootaxa.3841.4.7.
- 39)** O’Loughlin, P. M. (2001). The occurrence and role of a digitate genital papilla in holothurian reproduction. in *Echinoderms 2000: proceedings of the 10th International Conference, Dunedin, 31 January - 4 February 2000.*, 363–368.
- 40)** Montgomery, E. M., Ferguson-Roberts, J. M., Gianasi, B. L., Hamel, J. F., Kremenetskaia, A., and Mercier, A. (2018). Functional significance and characterization of sexual dimorphism in holothuroids. *Invertebr. Reprod. Dev.* 62, 191–201. doi:10.1080/07924259.2018.1491898.
- 41)** Fratt, D. B., and Dearborn, J. H. (1984). Feeding biology of the Antarctic brittle star *Ophionotus victoriae* (Echinodermata: Ophiuroidea). *Polar Biol.* 3, 127–139. doi:10.1007/BF00442644.
- 42)** Grange, L. J., Tyler, P. A., Peck, L. S., and Cornelius, N. (2004). Long-term interannual cycles of the gametogenic ecology of the Antarctic brittle star *Ophionotus victoriae*. *Mar. Ecol. Prog. Ser.* 278, 141–155. doi:10.3354/meps278141.
- 43)** Hunter, R. L., and Halanych, K. M. (2010). Phylogeography of the Antarctic planktotrophic brittle star *Ophionotus victoriae* reveals genetic structure inconsistent with early life history. *Mar. Biol.* 157, 1693–1704. doi:10.1007/s00227-010-1443-3.
- 44)** Allen Brooks, R., Nizinski, M. S., Ross, S. W., and Sulak, K. J. (2007). Frequency of sublethal injury in a deepwater ophiuroid, *Ophiacantha bidentata*, an important component

of western Atlantic *Lophelia* reef communities. *Mar. Biol.* 152, 307–314.  
doi:10.1007/s00227-007-0690-4.

**45)** Dahm, C. (1999). Ophiuroids (Echinodermata) of southern Chile and the Antarctic: taxonomy, biomass, diet and growth of dominant species. *Sci. Mar.* 63, 427–432.  
doi:10.3989/scimar.1999.63s1427.

**46)** Puccinelli, E., von der Meden, C. E. O., McQuaid, C. D., and Ansorge, I. J. (2018). Biological characteristics of the rafting bivalve *Gaimardia trapesina* in the Southern Ocean. *Mar. Biol.* 165, 1–17. doi:10.1007/s00227-018-3430-z.

**47)** Simpson, R. D. (1977). The reproduction of some littoral molluscs from Macquarie Island (Sub-Antarctic). *Mar. Biol.* 44, 125–142. doi:10.1007/BF00386953.

**48)** Ituarte, C. (2009). Unusual modes of oogenesis and brooding in bivalves: the case of *Gaimardia trapesina* (Mollusca: Gaimardiidae). *Invertebr. Biol.* 128, 243–251.  
doi:10.1111/j.1744-7410.2009.00171.x.

**49)** Jossart, Q., Bauman, D., Moreau, C. V., Saucède, T., Christiansen, H., Brasier, M. J., et al. (2023). A pioneer morphological and genetic study of the intertidal fauna of the Gerlache Strait (Antarctic Peninsula). *Environ. Monit. Assess.* 195. doi:10.1007/s10661-023-11066-3.

**50)** Shabica, S. V. (1974). Reproductive biology of the brooding Antarctic lamellibranch *Kidderia subquadratum* Pelseneer.

**51)** Hall, S. J., and Todd, C. D. (1986). Growth and reproduction in the aeolid nudibranch *Aeolidia papillosa* (L.). *J. Molluscan Stud.* 52, 193–205. doi:10.1093/mollus/52.3.193.

**52)** Linse, K., Barnes, D. K. A., and Enderlein, P. (2006). Body size and growth of benthic invertebrates along an Antarctic latitudinal gradient. *Deep. Res. Part II Top. Stud. Oceanogr.* 53, 921–931. doi:10.1016/j.dsr2.2006.03.006.

**53)** Rosenfeld, S., and Aldea, C. (2011). Nuevos antecedentes sobre la biología y distribución del gasterópodo *Margarella expansa* (Sowerby, 1838)(Sowerby, 1838). *Amici Molluscarum* 19.

**54)** Blankley, W. O., and Branch, G. M. (1985). Ecology of the limpet *Nacella delesserti* (Philippi) at Marion Island in the sub-Antarctic southern ocean. *J. Exp. Mar. Bio. Ecol.* 92, 259–281. doi:10.1016/0022-0981(85)90099-1.

- 55)** González-Wevar, C. A., Chown, S. L., Morley, S., Coria, N., Saucède, T., and Poulin, E. (2016). Out of Antarctica: quaternary colonization of sub-Antarctic Marion Island by the limpet genus *Nacella* (Patellogastropoda: Nacellidae). *Polar Biol.* 39, 77–89. doi:10.1007/s00300-014-1620-9.
- 56)** Riisgard, H. U., Thomassen, S., Jakobsen, H., Weeks, J. M., and Larsen, P. S. (1993). Suspension feeding in marine sponges *Halichondria panicea* and *Haliclona urceolus*: effects of temperature on filtration rate and energy cost of pumping. *Mar. Ecol. Prog. Ser.* 96, 177–188. doi:10.3354/meps096177.
- 57)** Ereskovsky, A. V. “Sponge reproduction,” in *Encyclopedia of reproduction*, 485–490.
- 58)** Maldonado, M. (2006). The ecology of the sponge larva. *Can. J. Zool.* 84, 175–194. doi:10.1139/z05-177.
- 59)** Strano, F., Micaroni, V., Davy, S. K., Maldonado, M., and Bell, J. J. (2021). Reproduction and early life stages of the poecilosclerid sponge *Crella incrustans*. *Invertebr. Biol.* 140, 1–13. doi:10.1111/ivb.12335.
- 60)** Pérez-Porro, A. R., González, J., and Uriz, M. J. (2012). Reproductive traits explain contrasting ecological features in sponges: the sympatric poecilosclerids *Hemimycale columella* and *Crella elegans* as examples. *Hydrobiologia* 687, 315–330. doi:10.1007/s10750-011-0919-6.
- 61)** Goldstein, J., and Funch, P. (2022). A review on genus *Halichondria* (Demospongiae, Porifera). *J. Mar. Sci. Eng.* 10. doi:10.3390/jmse10091312.
- 62)** Maldonado, M., and Riesgo, A. (2008). Reproduction in the phylum Porifera: a synoptic overview. *Treballs la Soc. Catalana Biol.* 59, 29–49. doi:10.2436/tscb.v0i59.6686.
- 63)** Dayton, P., Jarrell, S., Kim, S., Thrush, S., Hammerstrom, K., Slattery, M., et al. (2016). Surprising episodic recruitment and growth of Antarctic sponges: implications for ecological resilience. *J. Exp. Mar. Bio. Ecol.* 482, 38–55. doi:https://doi.org/10.1016/j.jembe.2016.05.001.
- 64)** Koutsouveli, V., Taboada, S., Moles, J., Cristobo, J., Ríos, P., Bertran, A., et al. (2018). Insights into the reproduction of some Antarctic dendroceratid, poecilosclerid, and haplosclerid demosponges. *PLoS One* 13, 1–24. doi:10.1371/journal.pone.0192267.
- 65)** Dayton, P. K. (1979). Observations of growth, dispersal and population dynamics of some sponges in McMurdo Sound, Antarctica. *Colloq. Int. du CNRS* 291, 271–282.

**66)** Teixidó, N., Garrabou, J., Gutt, J., and Arntz, W. E. (2004). Recovery in Antarctic benthos after iceberg disturbance: trends in benthic composition, abundance and growth forms. *Mar. Ecol. Prog. Ser.* 278, 1–16. doi:10.3354/meps278001.