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Interactive comment on "Deep-sea scavenging amphipod assemblages from the submarine canyons of the Iberian Peninsula" *by* G. A. Duffy et al.

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This is an interesting paper, which provides good evidence for the impact of submarine canyons on the composition of deep-sea scavenging amphipod assemblages. The proposition that differences between canyon and abyssal plain assemblages primarily result from relative abundances, rather than species presence or absence, suggests that the elevated organic matter in canyons does not allow typically shallower-living scavenging amphipod species to extend bathymetric range. Although not discussed, this is highly relevant to the continuing debate regarding factors driving bathymetric

zonation on continental margins. Inclusion of temperature, salinity, oxygen concentration, and sediment total organic carbon data would be useful for such discussion, regardless of the absence of significant statistical effect on community composition.

The authors correctly identify the synergistic physiological effect of temperature and pressure, although clarification of the antagonistic relationship of these factors may be useful, e.g. "synergistic effect of low temperature and high pressure". However, the authors' statement that "the physiological limits of the species in this study remain unknown" is ambiguous. Brown and Thatje (2011) identify the maximum pressure tolerated by the upper bathyal amphipod *Stephonyx biscayensis* as 20 MPa at 1 and 3°C, and 25 MPa at 5.5°C (1 MPa = 100 m depth), consistent with the known natural distribution of this species. Rephrasing may help to clarify that it is the physiological limits of the species identified by Duffy et al. during the current study that remain uncertain.

Duffy et al. recognise the potential impacts of temperature and pressure on species distributions but do not discuss the current limitations to such knowledge. Studies of high pressure and low temperature effects across hierarchical levels of organisation in adult benthic invertebrates have focused on shallow-water and upper-bathyal species to elucidate evolutionary mechanisms of deep-sea colonisation (e.g. Brown and Thatje, 2011; Oliphant et al., 2011; Cottin et al., 2012). Such studies have resulted in the proposition that the biodiversity bottleneck apparent in bathymetric zonation on continental margins reflects a physiological bottleneck at bathyal depths imposed by the combined effects of high pressure and low temperature, and that passage to deeper water requires adaptation to these factors (Brown and Thatje, 2011). Whilst it is likely that the species identified during the present study display such adaptations to low temperature and high pressure, and that this results in sufficient sensitivity to decreased pressure and increased temperature of shallower depths to restrict the upper bathymetric limit of these deeper species, it is important to highlight that the effects of decreasing pressure and increasing temperature on such species have not been thoroughly

assessed experimentally. Technology currently in development will soon allow such experimental research. Assumptions based on the difficulties of maintaining animals through rapid recovery are confounded by the uncontrolled stresses involved.

References

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