Getting trapped: *Lanice conchilega* structures carbon flows in soft-bottom intertidal areas

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Biogenic reefs constructed by the tube-building ecosystem engineer *Lanice conchilega* (Terrebilidae, Polychaeta) have profound structuring impacts on the benthic environment by altering the biogeochemical and physical properties of the sediment. Their role in food web dynamics of soft-bottom intertidal areas is less well studied and hitherto considered to be rather limited. Besides, whereas previous studies looked at qualitative aspects, another important aspect of food web research comprises the quantification of food web flows, which yields a more realistic approximation of complex food webs. Therefore, this study provides new insights in the functioning of *L. conchilega* reefs in intertidal sediments by quantifying the carbon flows in the food webs in the presence and absence of the tubeworm using linear inverse models (LIMs).

The inverse food web models were based on an empirical dataset from two study sites and two time periods, consisting of biomass and stable isotope data, and general physiological constraints from the literature. The carbon input into reef food webs (191 ± 50 mmol C m^{-2} d^{-1}) is about 40 times higher compared to bare sand areas (5 ± 2 mmol C m^{-2} d^{-1}) and is mainly derived from organic matter (OM) in the water column. Most of the OM input towards these reefs is consumed by suspension feeding macrofauna, particularly *L. conchilega* itself. However, the worm is not an important source of carbon for other macrofaunal organisms and hence provides only a facilitating role. The ratio of OM input to primary production indicates that the OM needs to be produced in an area at least 15 times larger than the reef itself, demonstrating significant OM 'focussing' within the reef food web. In conclusion, the reef structures created by *L. conchilega* act as a trap of OM, resulting in overall high macrofaunal biomass in the presence of the tubeworm, and much more diverse food webs.

Keywords: linear inverse model; biogenic habitat food web; network analysis; stable isotopes; Lanice conchilega; ecosystem engineering