## Supplement 3

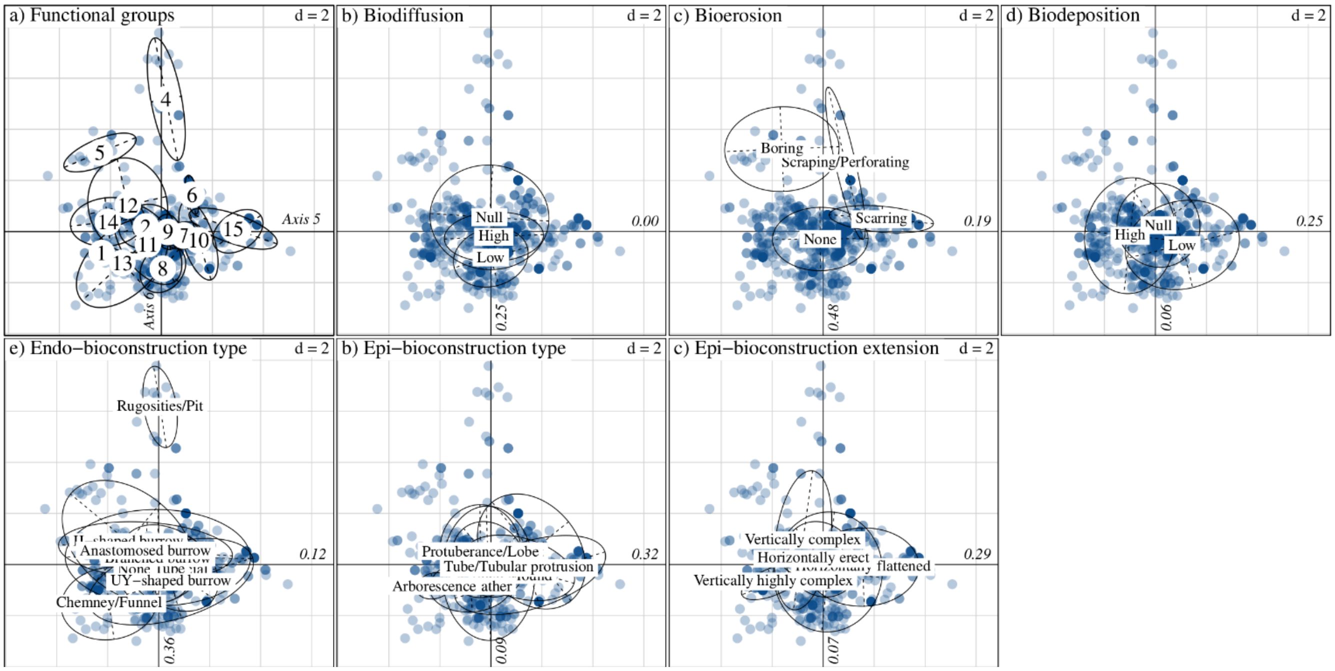


Fig. S3.1. Multiple Factor Analysis, representations of functional groups and trait modalities along the axes 5-6. Blue dots, species positions; values in italics, correlation ratios. Only traits substantially expressed on the axes are displayed (see Table 4); modalities are positioned at the gravity centre of their respective species; axis 5 discriminates group 5 (borers) composed of bivalves that realise biodeposition (suspension feeding); axis 6 discriminates the bioeroder groups 4 and 5. “d” indicates the grid scale

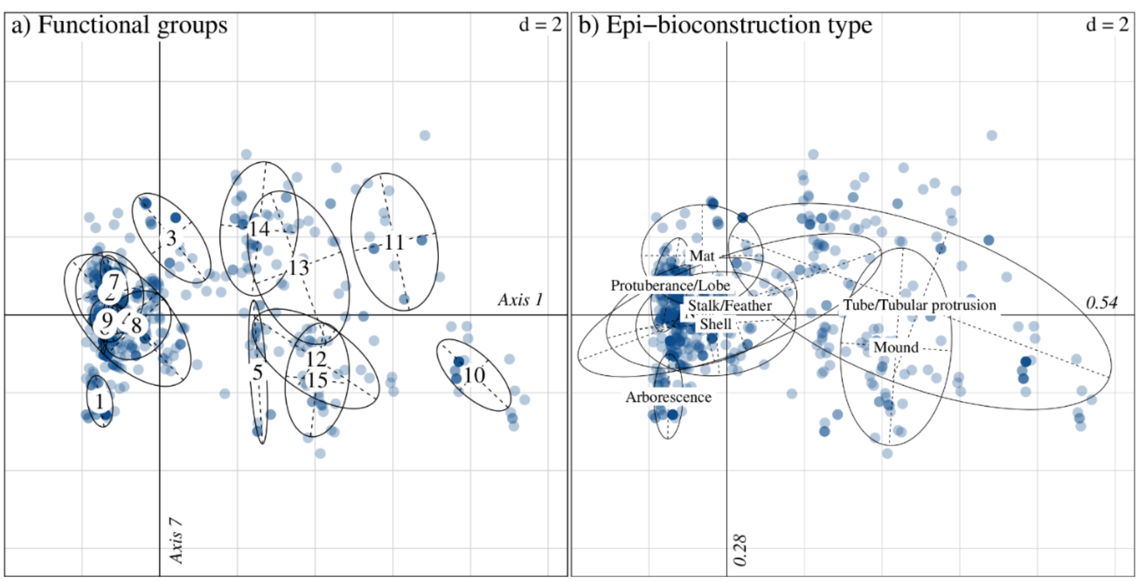


Fig. S3.2. Multiple Factor Analysis, representations of functional groups and trait modalities along the axes 1-7. Blue dots, species positions; values in italics, correlation ratios. Only the trait “Epi-bioconstruction type is substantially expressed on the axes (see Table 4); modalities are positioned at the gravity centre of their respective species; “d” indicates the grid scale

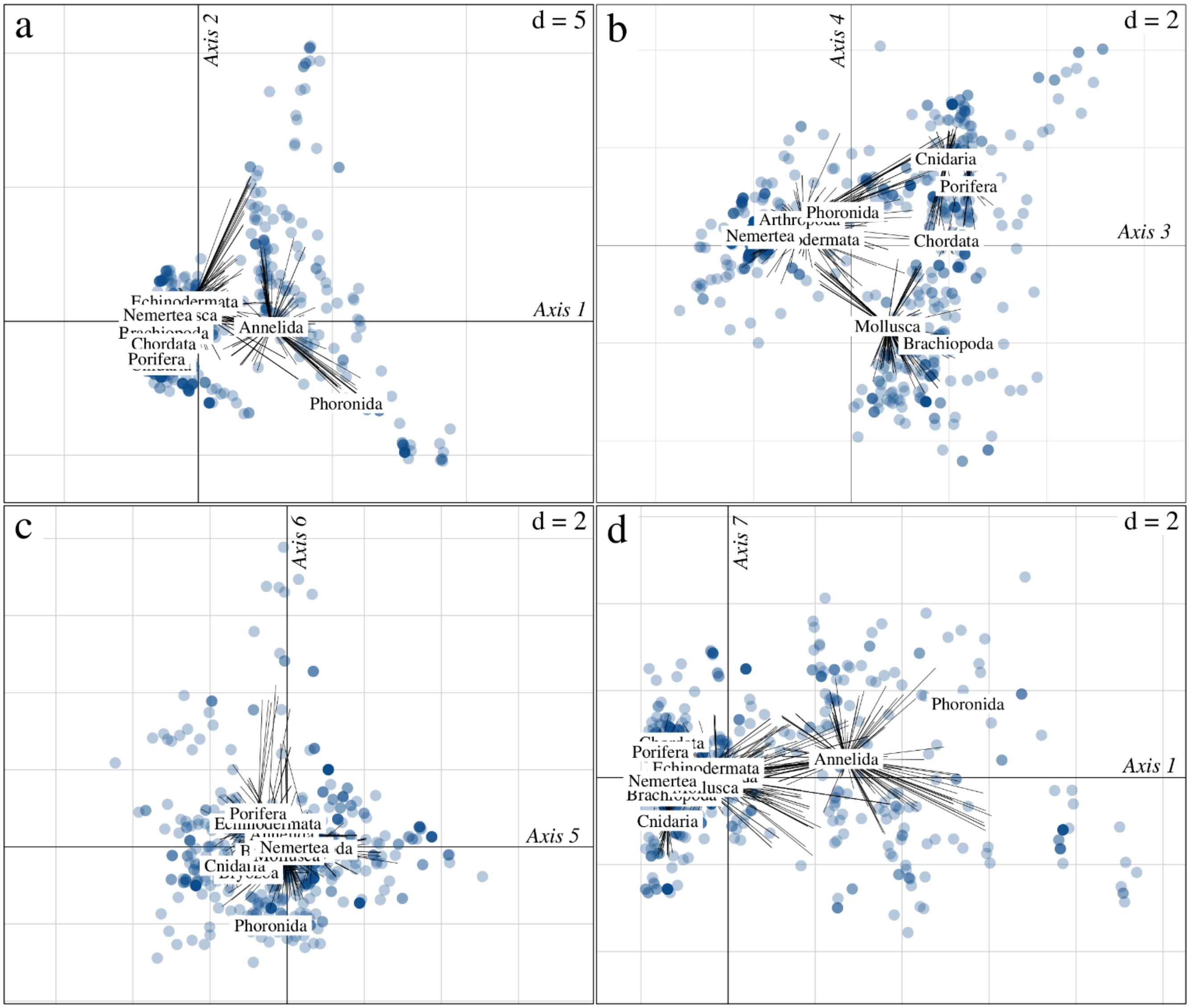


Fig. S3.3. Multiple Factor Analysis, taxonomic specificities in the effect trait pattern. Species (blue dots) are grouped by their respective phylum. From a to d, axes 1-2, 3-4, 5-6 and 1-7, respectively. "d" indicates the grid scale. Taxonomically specific functions are limited to worms (Annelida and Phoronida) in terms of burrowing ability (a, axis 1), and to Mollusca and erect organisms (Cnidaria and Porifera) in terms of epi-bioconstructions (shell and other emergent structures; b, axes 3-4)

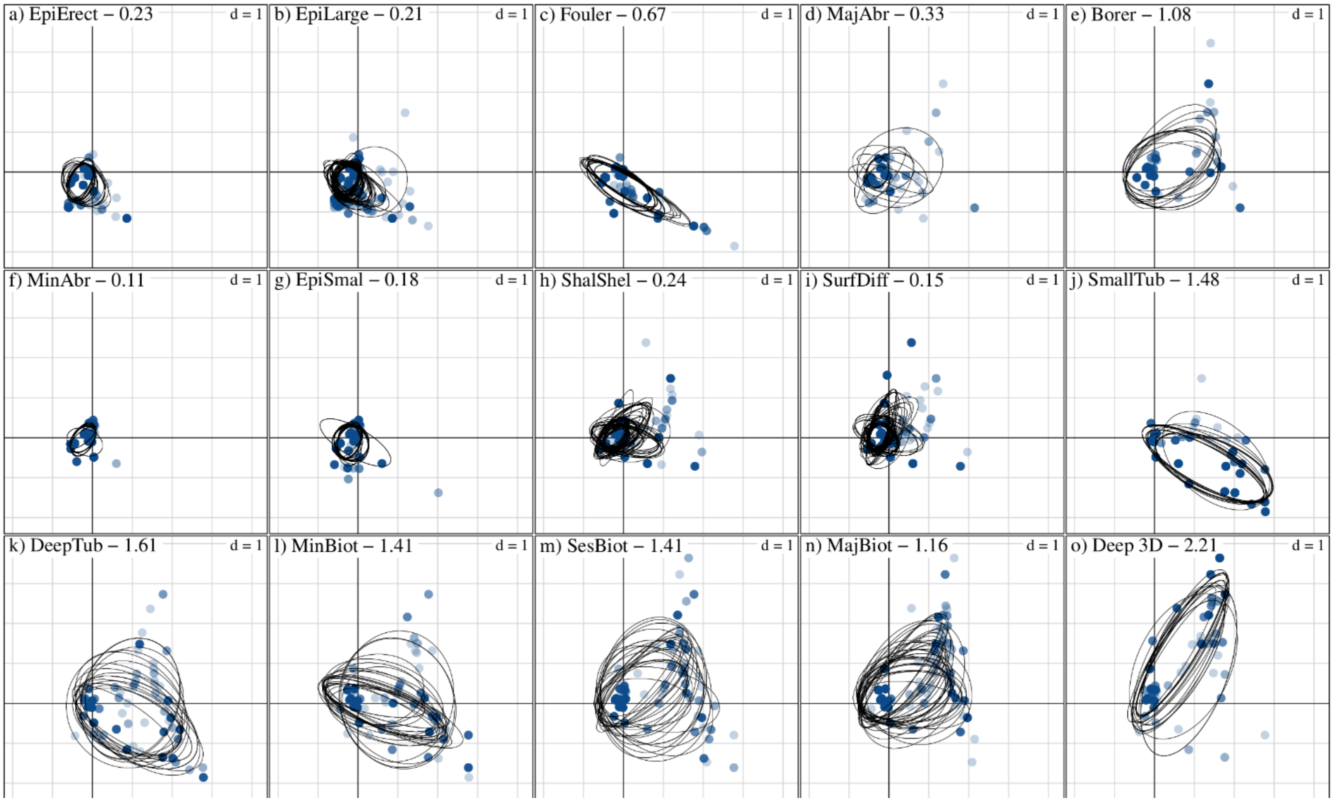


Fig. S3.4. Multiple Factor Analysis, representation of functional niches on axes 1-2. Each panel refers to a functional group. Blue dots, species positions. For a given group, a species is characterised by 15 positions, each of them referring to a trait; each ellipse refers to a species by encompassing its 15 positions (niche breadth); the value next to the label indicates the average niche breadth as the sum of the variances of the 2 axis scores

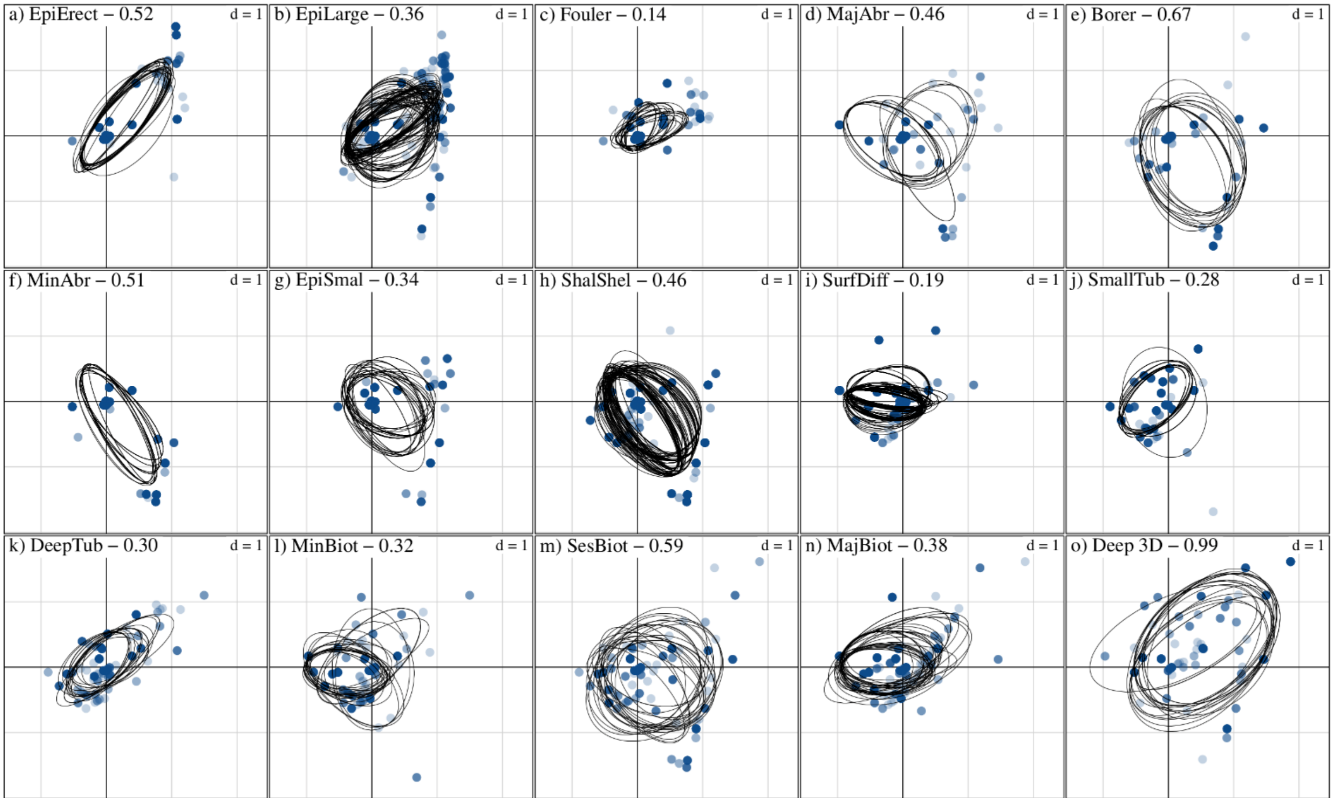


Fig. S3.5. Multiple Factor Analysis, representation of functional niches on axes 3-4. Each panel refers to a functional group. Blue dots, species positions. For a given group, a species is characterised by 15 positions, each of them referring to a trait; each ellipse refers to a species by encompassing its 15 positions (niche breadth); the value next to the label indicates the average niche breadth as the sum of the variances of the 2 axis scores

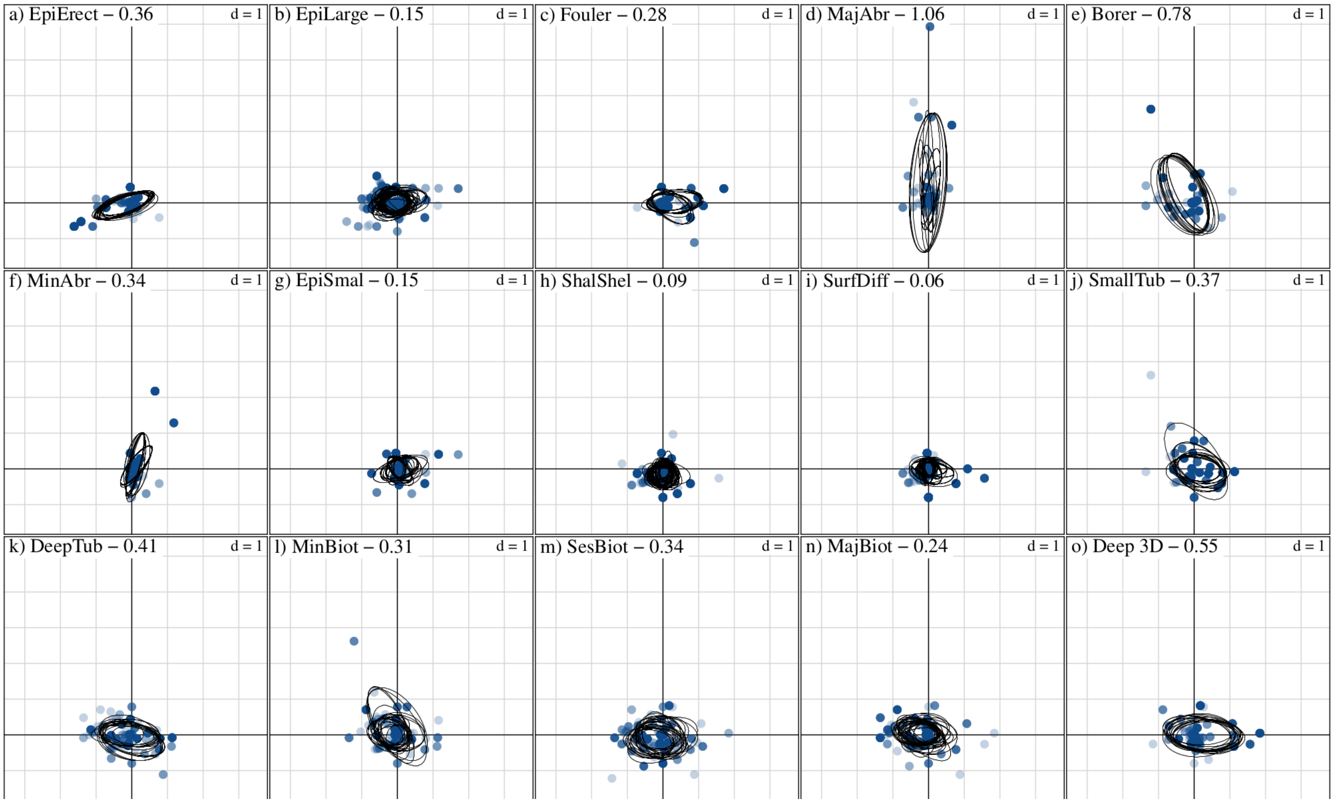


Fig. S3.6. Multiple Factor Analysis, representation of functional niches on axes 5-6. Each panel refers to a functional group. Blue dots, species positions. For a given group, a species is characterised by 15 positions, each of them referring to a trait; each ellipse refers to a species by encompassing its 15 positions (niche breadth); the value next to the label indicates the average niche breadth as the sum of the variances of the 2 axis scores

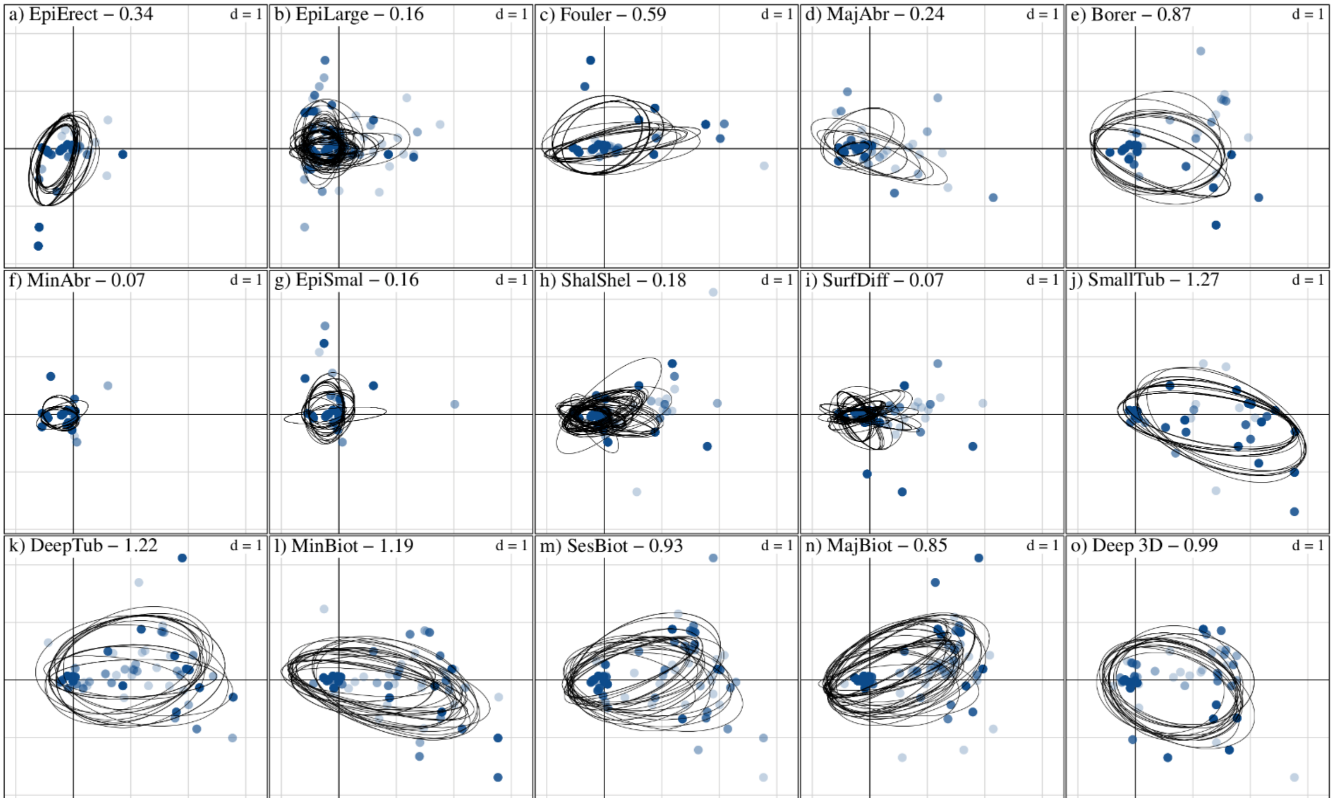


Fig. S3.7. Multiple Factor Analysis, representation of functional niches on axes 1-7. Each panel refers to a functional group. Blue dots, species positions. For a given group, a species is characterised by 15 positions, each of them referring to a trait; each ellipse refers to a species by encompassing its 15 positions (niche breadth); the value next to the label indicates the average niche breadth as the sum of the variances of the 2 axis scores

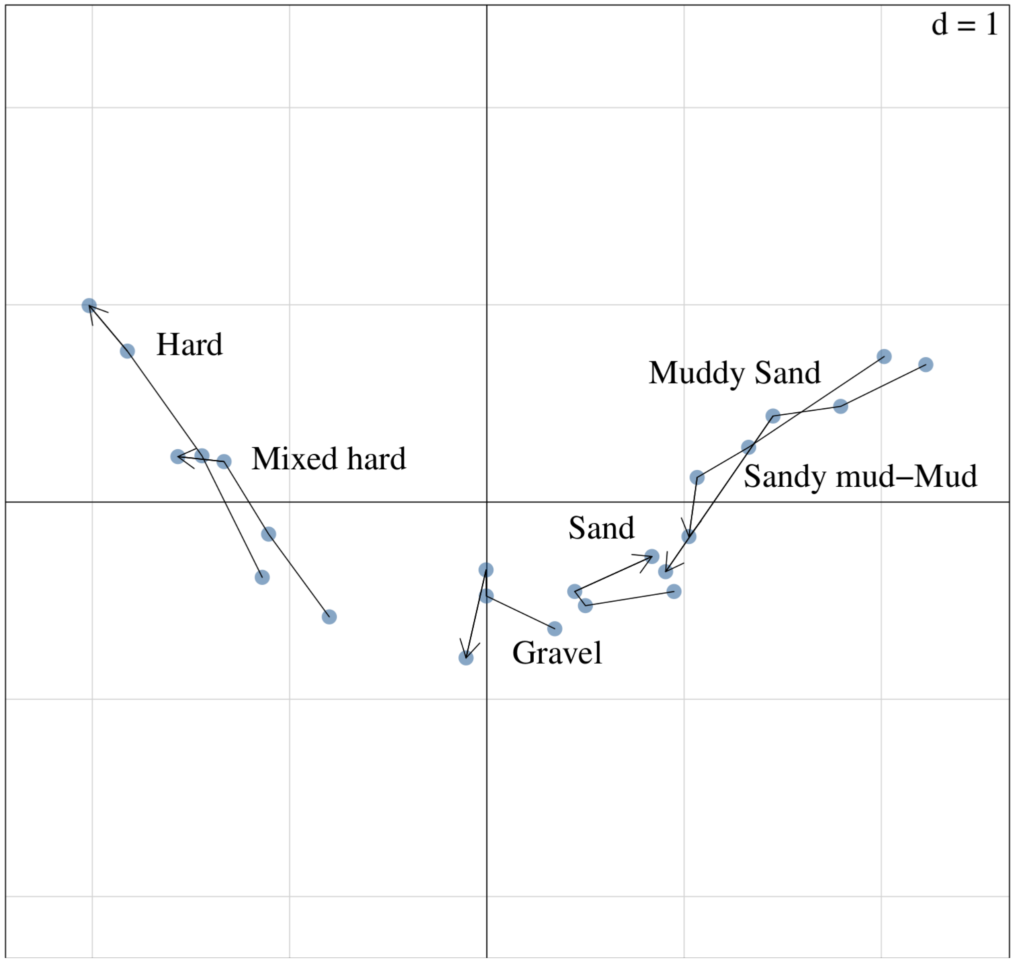


Fig. S3.8. Double Principal Coordinate Analysis, representation of depth. Blue dots, habitats as combinations of substratum and depth. Depth trajectory: intertidal, shore (0-20m), shelf (20-200m) and deep (>200m, arrow tip). No clear depth gradient common to the 6 substrata appears along the first or the second axis, except within hard and muddy habitats, reciprocally reversed. “d” indicates the grid scale. Whereas the change in functional composition in muddy habitats may be due to low oxygen concentrations in deep zones that limit burrowing, changes in hard substrata is due to the increasing presence of large arborescent coral forms from group 1 in the deep (e.g. *Antipathella* spp., *Paragorgia arborea*)

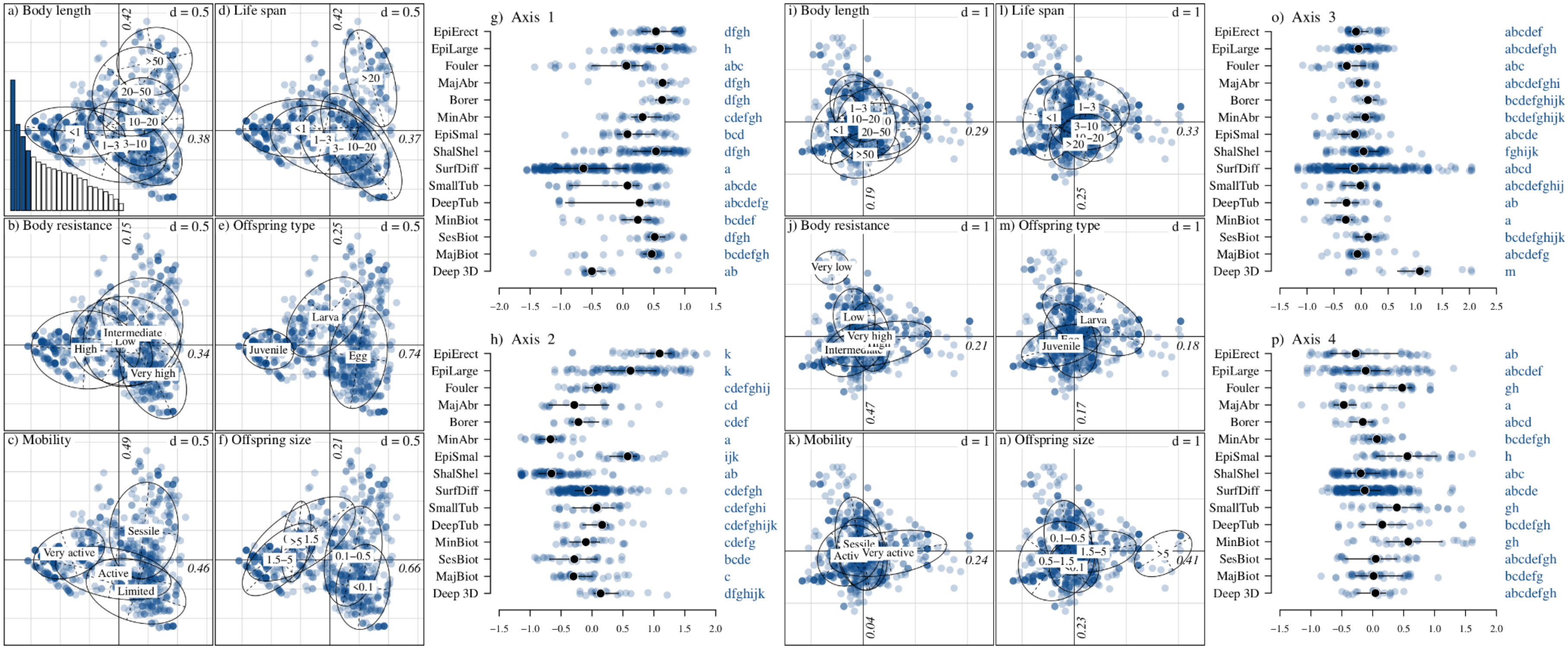


Fig. S3.9. Relationships between the functional groups and the axes of a Fuzzy Correspondence Analysis on the response traits used in the calculation of the sensitivity, recoverability and vulnerability components (except burrowing depth, being also an effect trait included in the partition of the functional groups). 4 axes are represented. a-f) Axes 1 and 2. g-h) Functional group distributions along axes 1 and 2. i-n) Axes 3 and 4. o-p) Functional group distributions along axes 3 and 4. g-h and i-n) Absence of blue letter (right side) indicates significant difference; Bonferroni-corrected significance level of Dunn's test, $p \leq \alpha/2$, i.e. 0.025. Axes 1 and 2 display a typical fast-slow gradient from left to right and to the top (from small and short-lived to large and slow-growing, in association with specific offspring characteristics). Axes 3 and 4 provide additional combinations of living mode and offspring characteristics. There is no clear association of sea floor functions and these life history gradients

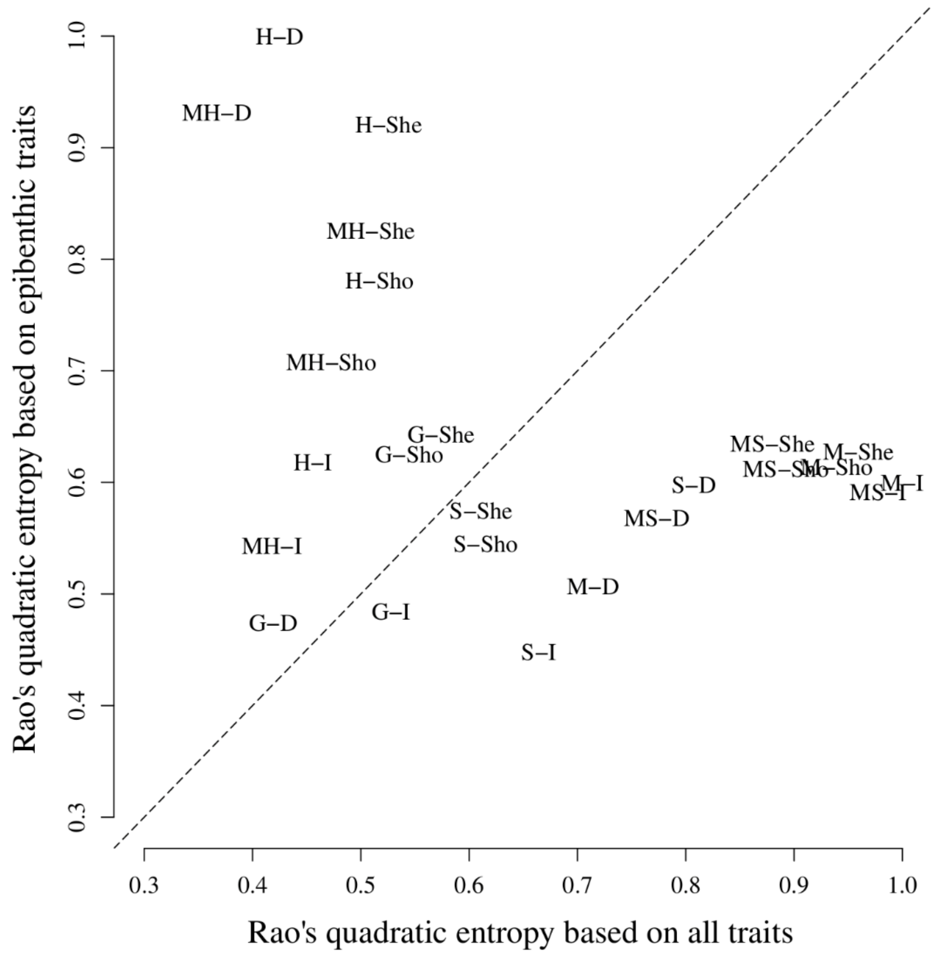


Fig. S3.10. Comparison of sea floor functional diversity based on different sets of traits. X-axis, based on the 15 traits. Y-axis, based on the 4 epibenthic traits: biodeposition, epi-bioconstruction type, epi-bioconstruction extension and epi-bioconstruction size; see Table 3. The same multivariate procedure was applied with these 4 traits. The Multiple Factor Analysis returned 4 significant axes that were used to derive a species × species distance matrix to calculate Rao's index for each of the 24 habitats. Labels: H, HM, G, S, MS and M for respectively hard, mixed hard, gravel, sand, muddy sand and sandy mud-mud; I, Sho, She and D for respectively intertidal, shore, shelf and deep. In order to make X- and Y-axes comparable, the two variables were divided by their respective maximum. The dashed line represents the 1:1 relationship. Based on the full set of traits (X), muddy habitats exhibit a much higher functional diversity due to the malleability of sediments that enables organisms to burrow and mix the substratum, and ultimately to participate to biogeochemical processes, next to below-substratum habitat creation (i.e. through galleries). The restricted use of the 4 epibenthic traits (Y) masks this bias and emphasises between-habitat differences from a common benchmark, i.e. based on epibenthic functions that are equally achievable in hard and soft substrata. The pattern shows a higher functional diversity in deeper hard substrata (from shore to deep). Nevertheless, the epibenthic functional diversity in soft sediments remains relatively high: whereas its maximum is 3-fold the minimum found in hard substrata when derived from all the traits, the maximum found in hard substrata is barely 2-fold the minimum found in soft sediments when derived from epibenthic traits. Again, this supports the higher multi-functionality of soft sediment species (functional niche breadth)