We then investigated the relationship between habitat division and eRIDE in a reduced complexity system for *n* fragments of the same shape, to tease apart the impact of division independent of geometric effects and biodiversity (Figure 6). At Z = 0.28, we discovered that when total biodiversity was fixed eRIDE was predicted to increase with division (Figure 6a). However within our model, this correlation is dependent on the value of Z, the rate of decline of the SAR. By fixing both risk and biodiversity and varying Z, we predict that fragmentation increases risk below Z values of 0.5 (Figure 6b). Analyses of invertebrate (n = 20), plant (n = 8) and vertebrate (n = 69) systems using ISAR IN FULL (ISAR) and RANSAC IN FULL (RANSAC) models (8) as well as microbial systems (n = 1) (9) suggest that Z is unlikely to reach 0.5 in ecology, ranging from 0.14 ± 0.09 standard deviations (SD, ISAR) for plants to 0.36 ± 0.09 SD (RANSAC) for invertebrates (Table 1). Thus, we predict that habitat division will increase eRIDE in all biologically relevant scenarios.

Furthermore, upon scaling the relative prevalence of patch-associated disease to reflect the presence of a dilution or amplification effect, we observed that increasing dilution increased the extent to which division influenced eRIDE, whereas amplification diminished the effect of division on eRIDE (Figure 4b).

We then investigated the link between geometric effects and eRIDE in a reduced complexity system, by examining a single shape of increasing “shape complexity”. Shape area was kept constant while complexity was altered by varying petal number and wave amplitude of De Broglie’s circles (Figure 7a). “Core habitat” was defined as the proportion of the area of the total shape that was contained within the largest circle that could fall entirely within the generated shape (which for de Broglie’s cirlces has its centre in the centre of the defined shape). The definition of solidity for this analysis was modified to be the proportion of the smallest circle that entirely enclosed the defined shape (circular convex hull) that was occupied by the defined shape. As shape area was fixed, eRIDE values were directly proportional to the shape’s total perimeter. Using these definitions, solidity and core habitat demonstrated a strong correlation which is independent of changes in shape (Figure 7b), showing that solidity is a good summary statistic for the proportion of core habitat in simple habitat shapes. Increasing wave amplitude and petal number resulted in decreased shape solidity. Solidity demonstrated a strong negative correlation with eRIDE (Figure 7c).