*Statistical Analyses* – All data wrangling and statistics were carried out in R 3.6.3 (R Core Team 2021). Before each quantitative statistical analysis, we compared an array of linear mixed random-and-fixed effects models, where the main predictors were coded as fixed effects. One of the models would have only the fixed effects, while another would also incorporate the random effects of the specimen and/or those of the species to control for pseudoreplication. The random effects term of the mixed model where both species and specimen terms were included had specimen coded as a nested term within species. We then used Akaike’s Information Criterion (AIC) to identify the best fitting model. When two or more models had a delta within 2 units, they were considered to have a comparable goodness-of-fit. In such cases, the simplest model with least number of parameters was chosen. To test for differences between architectures, we used linear mixed models with Tukey’s post-hoc pairwise contrasts calculated using estimated marginal means, reporting the difference magnitude and the p-value in supplementary tables S2A and S2B. We tested the significance of the effect of architecture by comparing the mixed model to a null model without the fixed effects of architecture using an ANOVA. To test the relationships between pairs of continuous variables across architectures (e.g. swimming speed vs. number of zooids), we used linear mixed model regressions. We evaluated the significance of the slope parameter when compared against a flat slope (one-tailed t-test) to test whether changes in the independent variable (e.g. number of zooids) were associated with changes in the dependent variable (e.g. swimming speed). Owing to the patchiness of some species despite 80+ hours spent underwater (Table S1), we used replicate measurements (n) from each specimen (N) in swimming speed ANOVAs and regressions. We used an exponential regression to test the relationship between speed and COT. Specimen means (N) were used for all COT comparisons and regressions. Individual measurements (n) were used up to determine oxygen consumption rates. To evaluate the relative contribution of zooid size, pulsation rate, zooid number, and architecture type on swimming speed, we fitted a linear mixed model and evaluated the significance and proportion of variance explained by each factor using their marginal R2.