

**Table S3. Cluster characteristics of cleaned data and the designated identities for the most abundant clusters.**

Trait values indicate the value at the centre of the clusters

| cluster number | proportion of cells | Designated identity | FL.Red. Range | X2.FL.Red. Range | FL.Orange. Range | Red1Red2. ratio | X2.FL.Red. Gradient | FWS. Length | FWS. Fill.factor | FL.Red. First |
|----------------|---------------------|---------------------|---------------|------------------|------------------|-----------------|---------------------|-------------|------------------|---------------|
| 1              | 0.434               | Chrysophytes        | 2.379         | 1.596            | 0.982            | 0.783           | 1.307               | 0.681       | -0.277           | 0.879         |
| 2              | 0.232               | Cyanobacteria       | 1.186         | 1.901            | 1.808            | -0.716          | 1.298               | 0.623       | -0.370           | 0.252         |
| 3              | 0.173               | Cryptophytes        | 2.275         | 1.736            | 2.192            | 0.540           | 1.264               | 0.892       | -0.267           | 0.581         |
| 4              | 0.067               | Greens              | 3.118         | 2.517            | 2.311            | 0.601           | 1.783               | 1.176       | -0.238           | 1.168         |
| 5              | 0.046               |                     | 1.620         | 1.428            | 1.606            | 0.192           | 1.081               | 0.812       | -0.234           | 0.365         |
| 6              | 0.018               |                     | 2.334         | 3.226            | 2.222            | -0.892          | 2.737               | 1.240       | -0.189           | 0.456         |
| 7              | 0.014               |                     | 2.740         | 1.822            | 3.233            | 0.918           | 1.584               | 0.814       | -0.301           | 0.741         |
| 8              | 0.010               |                     | 2.386         | 1.778            | 1.285            | 0.608           | 0.692               | 1.481       | -0.171           | 0.796         |
| 9              | 0.003               |                     | 2.236         | 3.031            | 2.774            | -0.795          | 0.521               | 1.611       | -0.493           | 0.333         |
| 10             | 0.002               |                     | 3.674         | 3.221            | 3.123            | 0.453           | 0.425               | 1.828       | -0.460           | 1.490         |
| 11             | 0.002               |                     | 1.566         | 2.256            | 1.916            | -0.690          | 1.380               | 1.880       | -0.109           | 0.343         |
| 12             | <0.001              |                     | 1.390         | 2.522            | 3.633            | -1.132          | 0.277               | 2.288       | -0.320           | 0.214         |