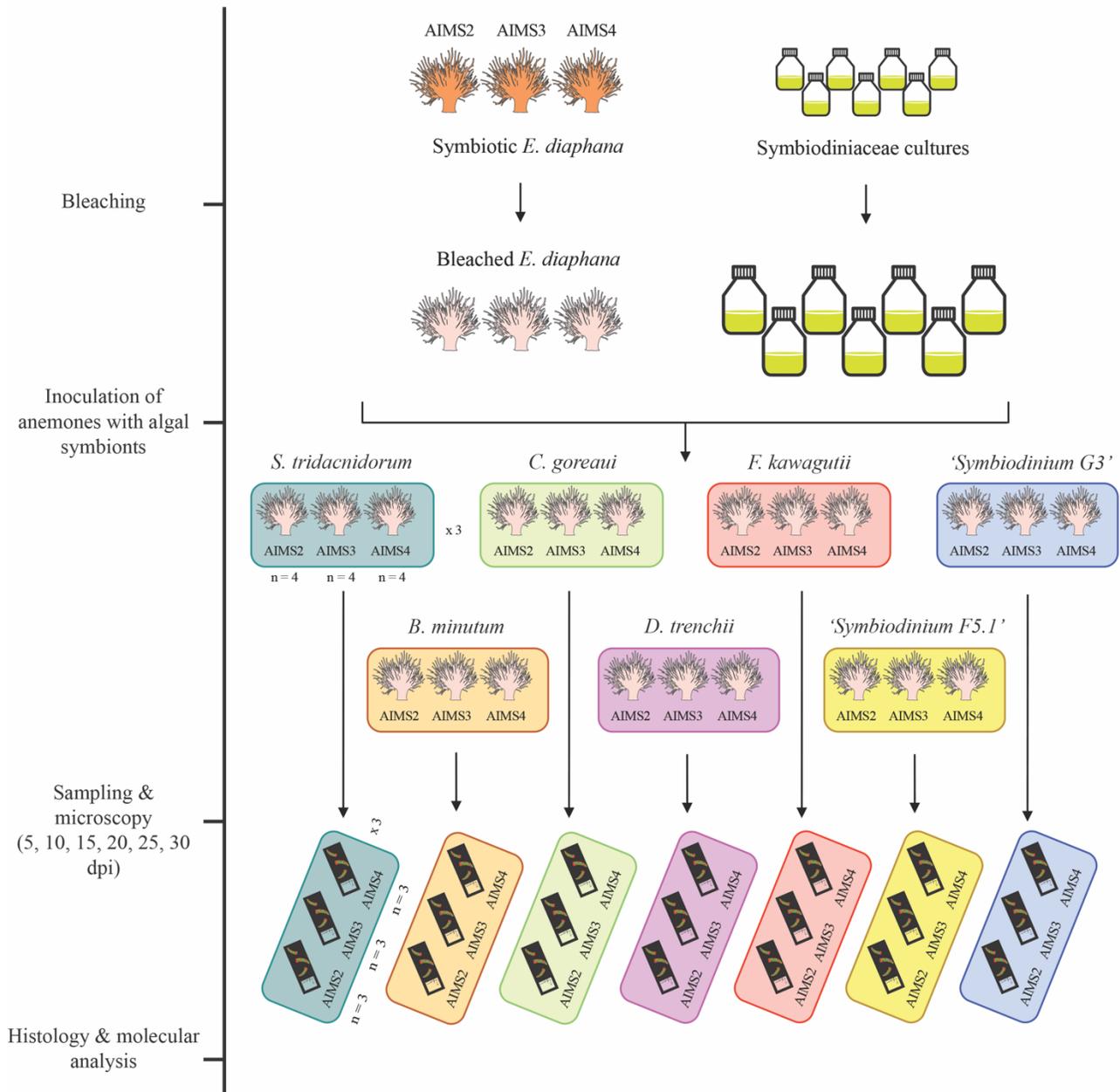


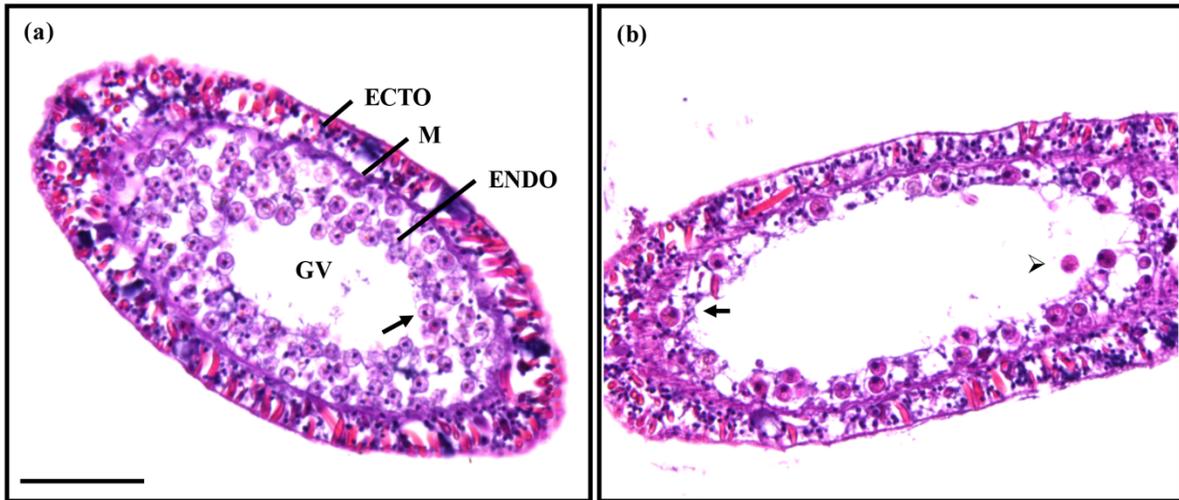
## *Supplementary Material*

**Supplementary Table 1.** Identity and source of Symbiodiniaceae cultures used in the experiment.

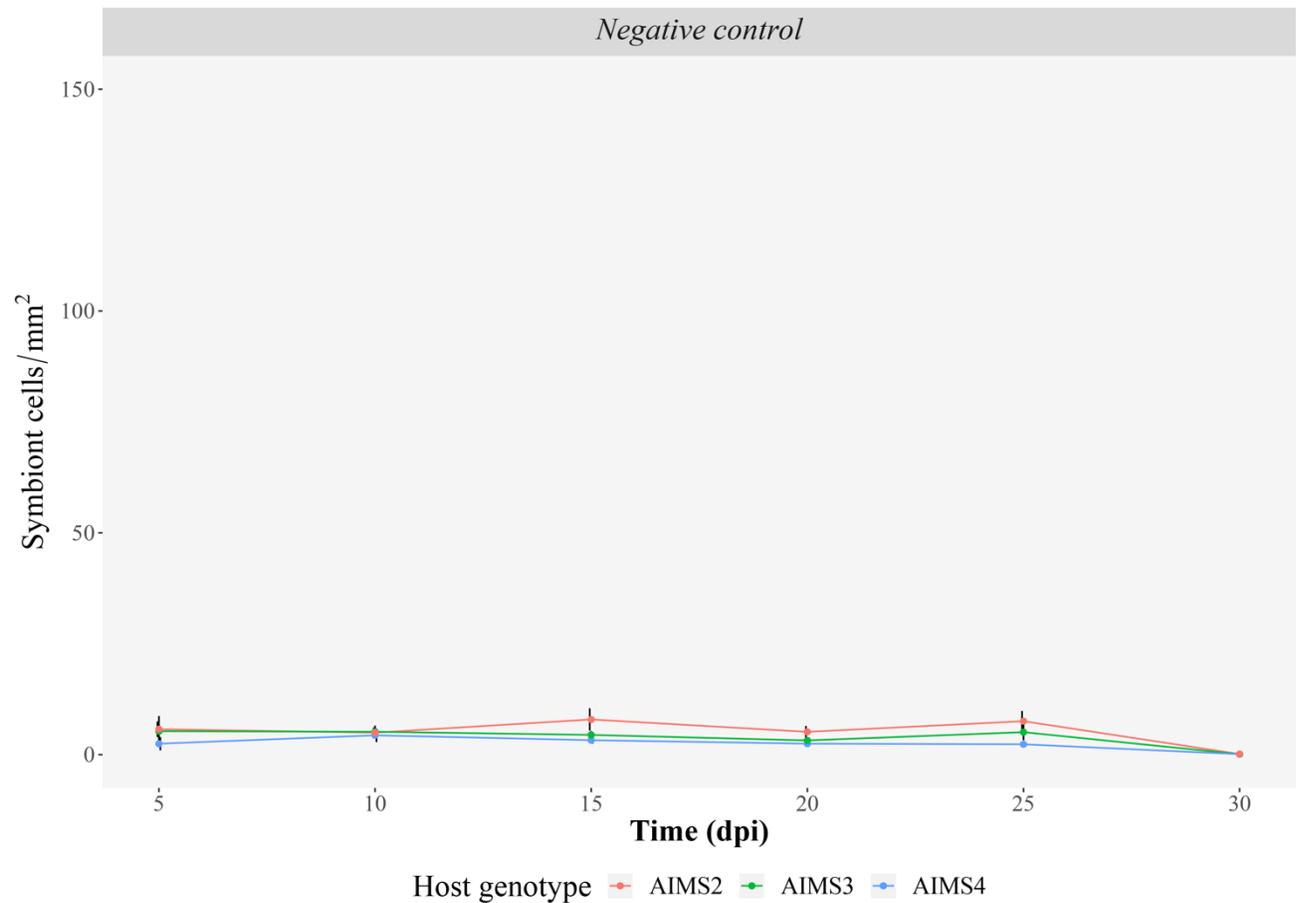
| Species                           | Strain ID     | ITS2 type | Host species                  | Geographic origin |
|-----------------------------------|---------------|-----------|-------------------------------|-------------------|
| <i>Symbiodinium tridacnidorum</i> | SCF 022.01    | A3c       | <i>Tridacna maxima</i>        | Heron Island      |
| <i>Breviolum minutum</i>          | MMSF 01       | B1        | <i>Exaiptasia diaphana</i>    | Central GBR       |
| <i>Cladocopium goreau</i>         | SCF 055-01.10 | C1        | <i>Acropora tenuis</i>        | Whitsundays       |
| <i>Durusdinium trenchii</i>       | SCF 086.01    | D1a       | <i>Porites lobata</i>         | Davies reef       |
| <i>Fugacium kawagutii</i>         | SCF 089.01    | F1        | <i>Pocillopora damicornis</i> | Heron Island      |
| undescribed                       | SCF 092.01    | F5.1      | <i>Pocillopora damicornis</i> | Heron Island      |
| undescribed                       | SCF 097.01    | G3        | <i>Diploastrea heliopora</i>  | Davies reef       |



**Supplementary Figure 1.** Experimental design showing the bleaching and inoculation of three aposymbiotic *E. diaphana* genotypes (AIMS2, AIMS3, AIMS4) with seven different Symbiodiniaceae strains (*S. tridacnidorum*, *B. minutum*, *C. goreau*, *D. trenchii*, *F. kawagutii*, 'Symbiodinium F5.1', 'Symbiodinium G3'). Each experimental unit, consisting of twelve anemones in total (four anemones per genotype), was inoculated with one algal symbiont type. Each experimental unit had three technical replicates. Three tentacles were sampled from three anemones per genotype per experimental unit every 5 days post infection for 30 days. At 30 dpi, histology and molecular analysis were performed to verify *bona fide* symbiosis with the inoculated strain. Anemone icon by Vega Asensio, culture bottle icon by Sumana Chamrunworakiat and tentacle icon by Iconic, all from the Noun Project and modified by Giada Tortorelli for this work.



**Supplementary Figure 2.** Localization of *B. minutum* (a) and *C. goreau* (b) within tentacles of *E. diaphana* at 30 dpi. (a) Histology on anemone tentacle colonized by *B. minutum*. ECTO= ectodermis; M= mesoglea; ENDO= endodermis; GV= gastrovascular cavity; the arrow indicates Symbiodiniaceae cell within the endodermis. Scale bar 50  $\mu$ m. (b) Histology on anemone tentacle colonized by *C. goreau*; Symbiodiniaceae cells are found within the endodermis (arrow) and in the gastrovascular cavity (arrow head).



**Supplementary Figure 3.** *E. diaphana* genotypes (AIMS2, AIMS3, AIMS4) of the negative control (N = 146) during the 30-days experiment. Mean ( $\pm$ SEM) density of the algal symbiont in tentacles of three anemones *per* genotype at each time point post inoculation (5, 10, 15, 20, 25, 30 days post inoculation, days post inoculation). Where error bars are not visible, they are small and hidden by the symbols.