Supplementary Material

**Supplementary material 1**

Minimum, mean and maximum sea water temperature layers of each sampling location were assessed using R software environment (R Development Core Team, 2016) and Bio-Oracle (<http://www.bio-oracle>) (Assis et al, 2017). The 3 nearest cells from each sampling sites were selected.

Bio-Oracle temperature layers used for Roscoff, Galicia and Morocco: BO2\_tempmax\_ss Maximum sea surface temperature
BO2\_tempmin\_ss: Minimum sea surface temperature

BO2\_tempmean\_ss: Mean sea surface temperature

For Italy, a deep population (50m depth), the following layers were used:  BO\_bathymax: Maximum depth of the seafloor (depth constrained between -39 to -56 m)
BO2\_tempmax\_bdmax: Maximum sea water temperature at the bottom at maximum bottom depth
BO2\_tempmin\_bdmax: Minimum sea water temperature at the bottom at maximum bottom depth
BO2\_tempmean\_bdmax: Mean sea water temperature at the bottom at maximum bottom depth



Supplementary Figure S2. Average density (cm2) of sexual (A) and asexually (B) formed sporophytes of different populations of *Laminaria ochroleuca* after recovery from different thermal treatments (17°C, 23°C, 25°C, and 27°C). Box plots with median, boxes for 25th and 75th percentiles and whiskers indicating min and max values (n = 4).