**SUPPLEMENTARY MATERIAL:**

| Area | Event No | Starting Date | Ending date | Duration (Days) | Intensity ( °C ) | Category |
|---|---|---|---|---|---|---|
| **North Adriatic** | 1 | 21-3-2023 | 25-3-2023 | 5 | 2.6 | Moderate |
| | 2 | 15-7-2023 | 23-7-2023 | 9 | 2.9 | Moderate |
| | 3 | 18-8-2023 | 28-8-2023 | 11 | 3 | Strong |
| | 4 | 16-9-2023 | 23-9-2023 | 8 | 2.5 | Moderate |
| | 5 | 1-10-2023 | 5-11-2023 | 36 | 2.6 | Strong |
| | 6 | 30-11-2023 | 4-12-2023 | 5 | 2 | Moderate |
| **East Sicily** | 1 | 7-7-2023 | 27-7-2023 | 21 | 2.6 | Strong |
| | 2 | 23-8-2023 | 27-8-2023 | 5 | 1.6 | Moderate |
| | 3 | 5-10-2023 | 3-11-2023 | 30 | 1.7 | Moderate |
| **North Sicily** | 1 | 23-3-2023 | 27-3-2023 | 5 | 1.4 | Strong |
| | 2 | 10-7-2023 | 3-8-2023 | 25 | 2.5 | Strong |
| | 3 | 7-10-2023 | 24-11-2023 | 24 | 1.6 | Moderate |

**Table S1: Metrics of the MHWs identified in the 3 study areas, following the framework proposed by Hobday et al. (2016). The events were detected using the spatially-averaged SST time series between 1982-2023, from the Mediterranean Sea SST Analysis L4 product of the Copernicus Marine Service (https://doi.org/10.48670/moi-00173) .**

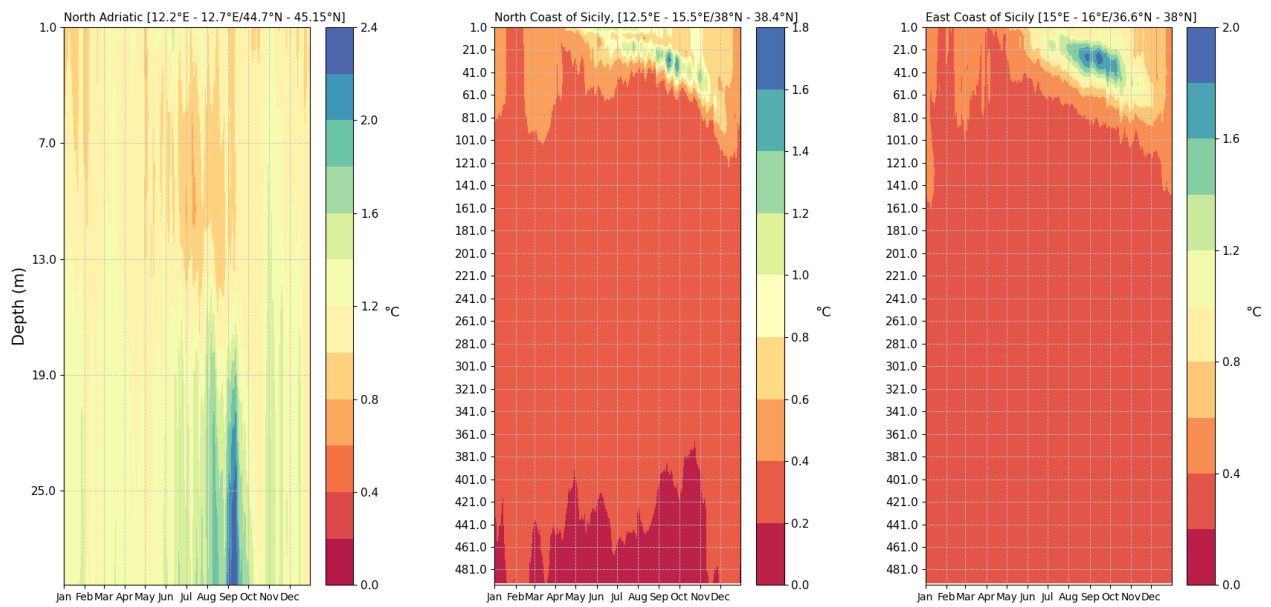
**Figure S1: Daily, standard deviation of the spatially-averaged temperature at each depth, for the Northern Adriatic** *(left),* **Northern** *(middle)* **and Eastern** *(right)* **Sicily study areas. Standard deviation is based on the period 1993-2023. Temperature data were obtained from the Mediterranean Sea Physics Reanalysis dataset**

**https://doi.org/10.25423/CMCC/MEDSEA_MULTIYEAR_PHY_006_004_E3R1**

**Figure S2. Weekly and spatially-averaged temperature at each depth in the Northern Sicily study area for the period between the end of May and the end of July. Climatological (1993-2016) temperatures are indicated in blue and those of 2023 in pink. The vertical temperature profiles correspond to the period with the highest negative, subsurface temperature anomalies of 2023 (see Figure.3d). Temperature data were obtained from the Mediterranean Sea Physics Reanalysis dataset** https://doi.org/10.25423/CMCC/MEDSEA_MULTIYEAR_PHY_006_004_E3R1

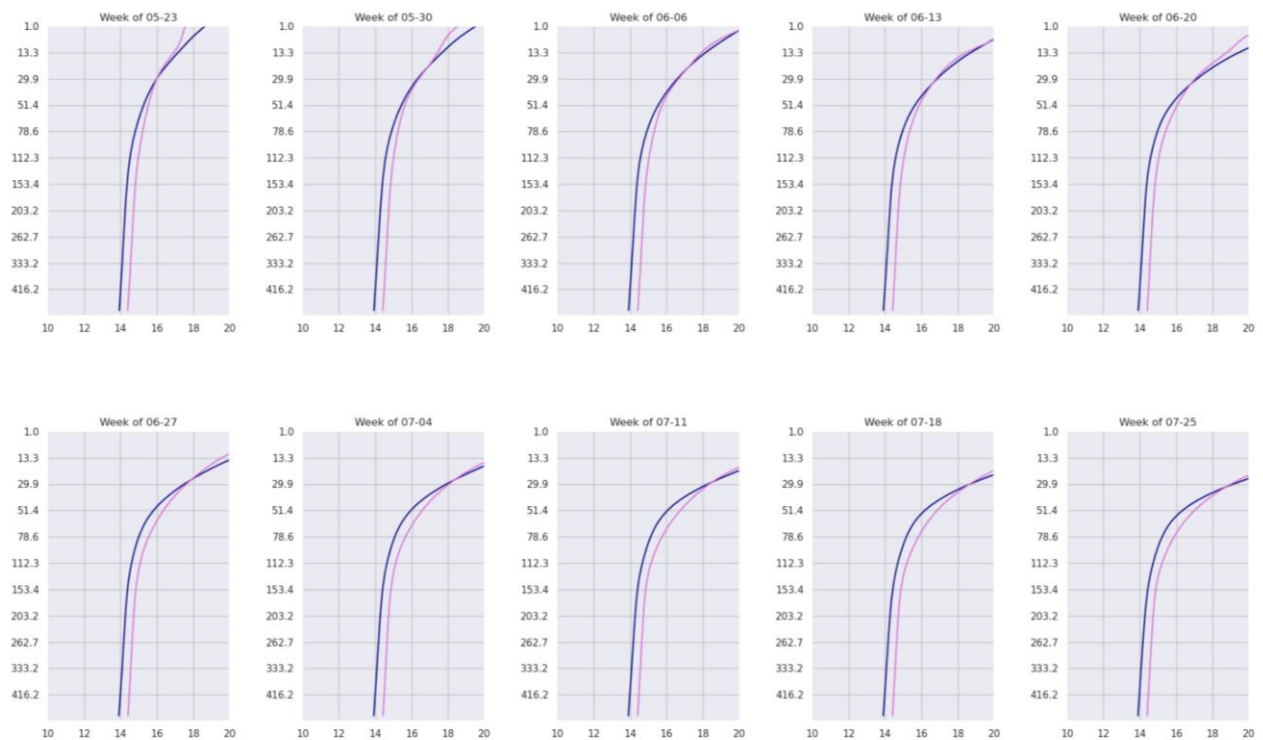
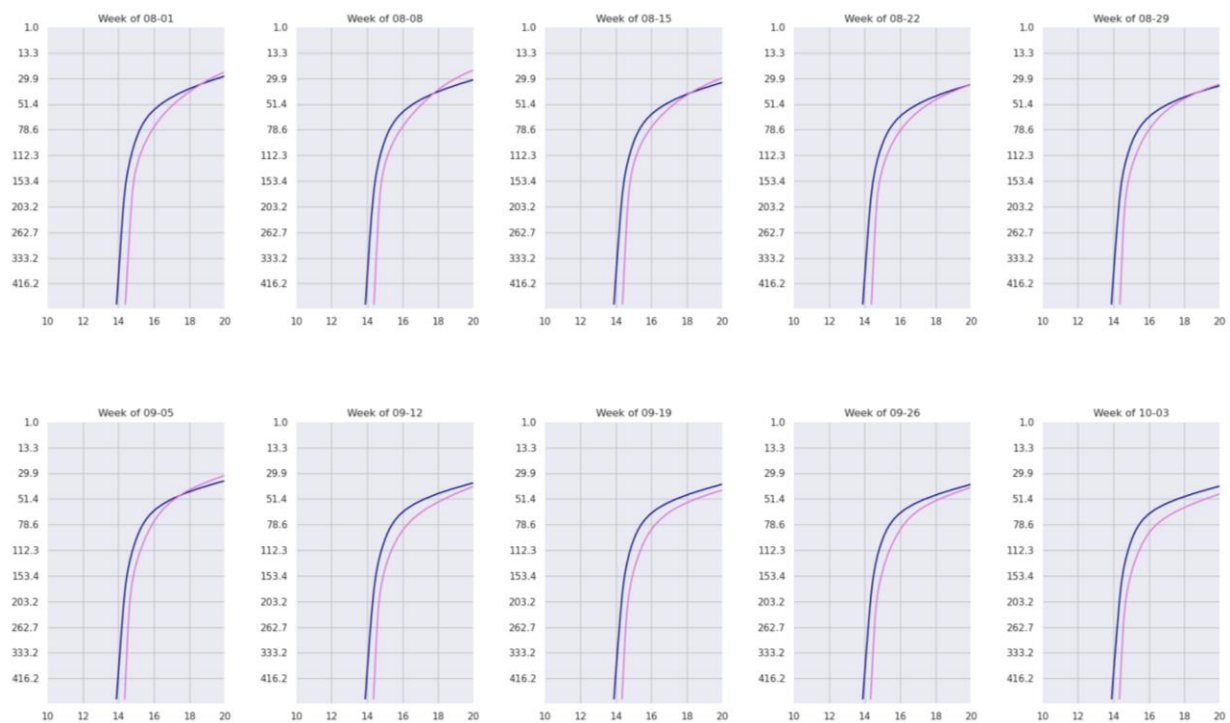



**Figure S3. As in Figure S2 but for the Eastern Sicily study area and the period August-October.**

**Figure S4: Case containing male and female blue crab specimens, females show ventral part filled with eggs (top). Many cases containing blue crab, each case can hold up to 200 kg of specimens (lower left), pictures highlighting the presence of blue crab in the Scardovari lagoon (lower right)**

**Figure S5:Net containing fireworms that feed on caught fish (top). Fireworms attached at fisch net (lower left), and large amount of fireworms catched during fish activities (lower right).**