Vulnerability of Northern Adriatic to Warming and Intensification of Marine Heat Waves

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Northern Adriatic Shelf (NAS) is a shallow, semi-enclosed northern part of the Adriatic basin, and as such rapidly responds to climate change. Multidecadal satellite and in-situ sea surface temperature (SST) time series on the NAS indicate a warming trend. During 1995-2015, SST in the Gulf of Trieste increased at a rate of 0.08°C ± 0.01°C per year (amounting to 1.6°C in 20 years), a trend indicative of the entire NAS shelf.

We use a centennial SST time series from Trieste (Raicich and Colucci, 2019) to construct a climatological year as a base for SST day-of-year anomaly estimation. We show that yearly number of discrete periods of extreme warming (Marine Heat Waves - MHW) and extreme cooling (Marine Cold Spells - MCS) exhibit clear seasonality. Both positive and negative anomalies from climatological SST manifest maximum variance in the summer months. The frequency of MHW has increased, while the number of Marine Cold Spells (MCS) is declining.

Sea warming and MHW intensification are potent agents of disturbance, particularly for sessile taxa and species residing near their warm range edges. In the NAS extreme events may force regression of habitat-forming species such as seagrass Zostera marina and increase bleaching episodes of coral Cladocora caespitosa. Warming events may be associated with the inflow of invasive non-indigenous species and expand the period of occurrence, such as harmful gelatinous invader Mnemiopsis leidyi. In contrast, a reduced number of MCS during winter may enhance survival of Aurelia polyps generating through strobilation more intense jellyfish blooms.