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Benthic foraminifera as proxies of temperature impact and dystrophic crisis affecting survival of Pacific oysters *Crassostrea gigas* (Thunberg) in Marennes-Oléron bay

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Among hypothesis explaining Pacific oyster *Crassostrea gigas* summer mortality, sediment feedback to *C. gigas* was investigated. It is well known that huge amounts of biodeposits accumulated during autumn and winter under oyster culture areas lead to sedimentary organic enrichment, and in turn alteration of sediment physical structure and geochemical functioning. Thus, due to temperature increase during spring and early summer, organic matter accumulated on intertidal mudflats is remineralizated and this may induce toxic fluxes (ammonia and sulphur) from sediments to the water column. Foraminiferal assemblages have been reported to react to physical disturbances or chemical pollution. Thus, the aim of the study was to determine how living (stained) benthic foraminifera react to organic matter remineralization. A field experiment was conducted in the oyster farming bay of Marennes-Oléron (Charente-Maritime, France) in order to monitor both sediment (Chl *a*, total organic carbon and organic nitrogen contents, $\delta^{13}C$ and $\delta^{15}N$ composition, sulphur and ammonia contents, pH, Eh, temperature) and water column (salinity, turbidity and percentage of saturation of dissolved oxygen) from April to August 2004. Foraminifera core samples were taken from one site in the top 8 cm sediment and sectioned in 5 slices: 0-0.5, 0.5-1, 1-3, 3-5 and 5-8 cm. Values of POC and PON, Chl *a* and ammonia contents increased between May 25 and June 10, whereas bottom-water oxygen saturation became severely depressed (O_2 saturation < 20%). Average temperatures increased from 12°C to 21°C, high daily thermal amplitude (maximum=12.3°C) was noted between May 15 and May 25 and during emersion time, sediment temperature reached a maximum value of 28°C on May 20. At the same time, turbidity was high (800 to 1400 NTU). During the short-term dystrophic crisis, at the end of this period, living (stained) foraminiferal abundances severally decreased from 10000 to 4000

individuals in 50 cm^3 of sediment. Increasing temperature associated with high daily temperature amplitude and short-term hypoxia affected benthic foraminiferal species survival. *Ammonia tepida* was still the most abundant species whereas *Haynesina germanica*, *Brizalina variabilis* and *Quinqueloculina seminula* declined. Instead of benefiting from high Chl *a* content and increasing temperature, foraminiferal assemblages were clearly disturbed when the average temperature reached 20°C, which is a temperature theoretically favourable to foraminifera growth and reproduction. This suggests that temperature, even if theoretically favourable to the benthos, including foraminifera, may have an indirect negative impact, mainly by leading to dystrophic conditions. One month after the dystrophic crisis, benthic foraminiferal species recolonized intertidal sediments, and *Cribroelphidium gunteri* appears as the most opportunistic species during recolonization.

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