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[Exploration of the inter-annual variability and multi-scale environmental drivers of European spiny lobster, *Palinurus elephas* \(Decapoda: Palinuridae\) settlement in the NW Mediterranean.](#)

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Abstract: Determining the drivers of key ecological processes of commercial marine species is important to acquire basic and essential knowledge for fisheries management and conservation. Here we report on a long-term monitoring of the settlement of the European spiny lobster, *Palinurus elephas*, the most commercially important spiny lobster species in the Mediterranean and north-eastern Atlantic. Densities of recently settled individuals (early benthic juveniles – EBJs) were recorded annually, as an approximation to annual settlement, from 2000 to 2016 (17 years) in three zones of the north-western Mediterranean: Catalonia (CAT), the Columbretes Islands (COL), and the Balearic Islands (BAL). Settlement, the end point that integrate most of the variability occurred during dispersion, is a complex ecological process governed by the interaction of biotic and abiotic factors that can be in turn influenced by the atmospheric and oceanographic conditions. Using linear regression of the size structure of EBJs, we demonstrate that settlement occurs synchronously in the three study zones. Densities of EBJs were handled as time series, and regression analysis revealed that CAT and COL covaried significantly, but none of them with BAL. Therefore, CAT and COL were analysed together using generalized linear model and much of their joint variability was explained by the mesoscale oceanographic index IDEA. Settlement in BAL showed a different pattern, explained by the joint effect of the atmospheric oscillations NAO and WEMO. Complexity of *P. elephas* settlement cannot be fully accounted neither for CAT-COL nor for BAL because settlement seems be driven by more complex unknown multi-factorial processes. Therefore, further studies are necessary to gain insight into other factors that allow short- or medium-term predictions of settlement. Expanding the study area across the Mediterranean would also allow establishing a complete knowledge of

the ecology of the species applicable to the management of the fishery.

Keywords: ecological processes, environmental drivers, long-term monitoring, *Palinurus elephas*, settlement, spiny lobster