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FORM FOR ABSTRACTS PRESENTATION

Title: **Spatial distribution patterns of the striped venus clam (*Chamelea gallina*, L. 1758) natural beds in the Gulf of Cádiz (SW Spain)**

SESSION: FLORA AND FAUNA

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ABSTRACT (MIN 3000 MAX 5000 CHARACTERS):

General frameworks and Objectives

The striped venus *Chamelea gallina* (Linnaeus, 1758) is a filter-feeding bivalve widely distributed in northeast (NE) Atlantic waters, the Mediterranean Sea and the Black Sea, inhabiting sandy-muddy bottoms at depths ranging between 5 and 20 m. *C. gallina* is the target-species of an important hydraulic dredge fishery in the Gulf of Cádiz (SW Spain; Fig. 1). The volume of catches exceeds 3,000 tons/year but has dramatically decreased in recent years threatening the biological and economic sustainability of the fishery (1). The objective of this study was to understand the distribution pattern of *C. gallina* and its spatial variability in order to help to take spatial management decisions.

Material and Methods

The study area (Fig. 1) is located in Southern Spain and includes the subtidal area of the Gulf of Cádiz, from the mouth of the Guadiana River to the mouth of the Guadalquivir River. Along this coast there are several Rivers mouths and waste water treatment plants (WWTP). A sampling survey has been carried out for 20 days (ACUVEN-3, May-June 2019) using a commercial hydraulic dredge. Sampling was conducted following a systematic scheme where stations were located every 1 nautical mile and covering 3 depth strata [3-6m] [7-9m] [9-12m]. In every station the dredge was deployed and towed parallel to the coast during 5 minutes. Each transect was also geo-referenced by means of a GPS in order to calculate the sampled area (m^2). 5 l. samples were randomly collected and sent to the laboratory and *C. gallina* individuals were counted and weighed. Shell length was measured to the lowest mm using calipers.

Estimates of the density, biomass and mean size of *C. gallina* and their distribution in the bottom have been obtained using the ordinary kriging technique (OK; ln-transformation = ln(variable+1)), by kriging observations on the nodes of a 0.25 Nm square-mesh grid. The average values over the domain were estimated by OK as well as the global estimations. Cross-validation procedure was performed to assure the best prediction. Geostatistical analyses were conducted using RGeostats (2, 3). The density index ($N.m^{-2}$) was also modeled using generalized additive model (GAM; 4). The explanatory variables considered in the model were: depth (m), sea bottom temperature (ºC), bottom sea salinity (psu), bottom chlorophyll-a concentration ($mg.m^{-3}$), turbidity (NTU), total dissolved solids (mg/l), mean grain size of sediment (GS, phi), sediment organic matter (%), distance to the nearest river mouth and WWTP (DRT, m).

Results and Discussion

The empirical variogram on density, biomass and mean size showed a clear spatial structure. Their shapes where dominated by a large-scale structure with a radius of about (5 Nm) giving an idea of the average diameter of patches.

The amplitude of the discontinuity at the origin of the variogram represented an unresolved small-scale variability. This geostatistical approach showed that Rivers mouths and WWTP plays an important role on density and biomass spatial distribution of *C. gallina*. Three important spots were identified along the coast mainly related to rivers mouths except for Guadiana River, and a smaller spot was also observed near to WWTP in Matalascañas (Fig. 2). The lowest values were predicted near Guadiana River and in the deepest areas of the easternmost area. The global estimation of the kriged mean and variance was 1.96 ± 0.048 ind/m^2 and 2.88 ± 0.06 g/m^2 for ln-density and ln-biomass, respectively. Regarding mean size results, the global estimation of kriged mean size was 18.54 ± 0.03 mm. Recruits were concentrated mostly in two zones: near the WWTP in Matalascañas and to the east of Guadiana River mouth, while adults appeared in the west of Guadalquivir River mouth and around Odiel-Tinto River mouth.

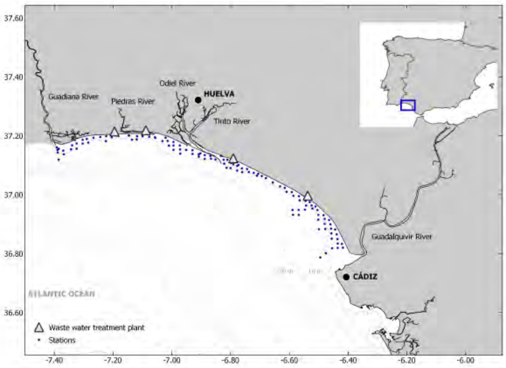

Figure 1. The study area in the SW Spanish coast (blue box). Sampling stations (ACUVEN-3 survey, blue points).WWTP (light blue triangles).

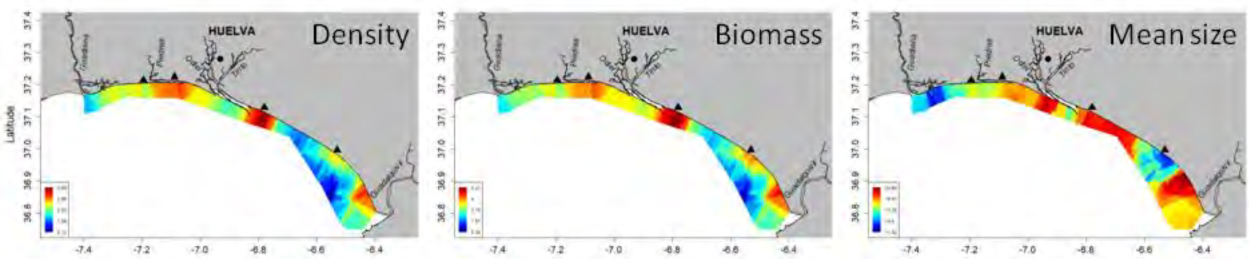

Figure 2. Kriged maps for density, biomass and mean size of C. gallina in the subtidal area of SW Spain. WWTP (black triangles)

The best GAM explained 48.3% of the deviance for ln-density included depth, DRT and GS as factors. The depth effect showed a non-linear pattern, with ln-density peaking at 6-7 m. Ln-density showed a direct linear pattern with GS, i.e. density increased parallel to grain mean size decreased. Regarding DRT, ln-density declined as the distance to the River mouth or WWTP increased.

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