SARDINE CPUE

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Bayesian spatio-temporal CPUE standardization: case study of European sardine (*Sardina pilchardus*) along the western coast of Portugal

Fishery dependent data is the most common source of data for assessment methods and it's collected with daily frequency.

Catch-per-unit-effort (CPUE) data can be influenced by factors such as environmental variables, fishing methods, fishing grounds, vessel length, fishing restrictions and economics (Maunder & Langley, 2004).

Objective

Standardize sardine's purse seine fishery dependent data as a relative abundance index (CPUE) with a Hierarchical Bayesian spatio-temporal model through R-INLA using different types ofrandom effects (Rue et al., 2009).

Methods and Results

Vessel length
Effort capacity variable smoothed effects (RW2), mean=22.40m

Year
Year included as a replica via random effects (iid), n=3

Month
Smoothed effects (RW2 cyclic) to catch the trend, n=12

01 02 03 04 05

N=3461

Vessel ID
Random effects (iid), n=66

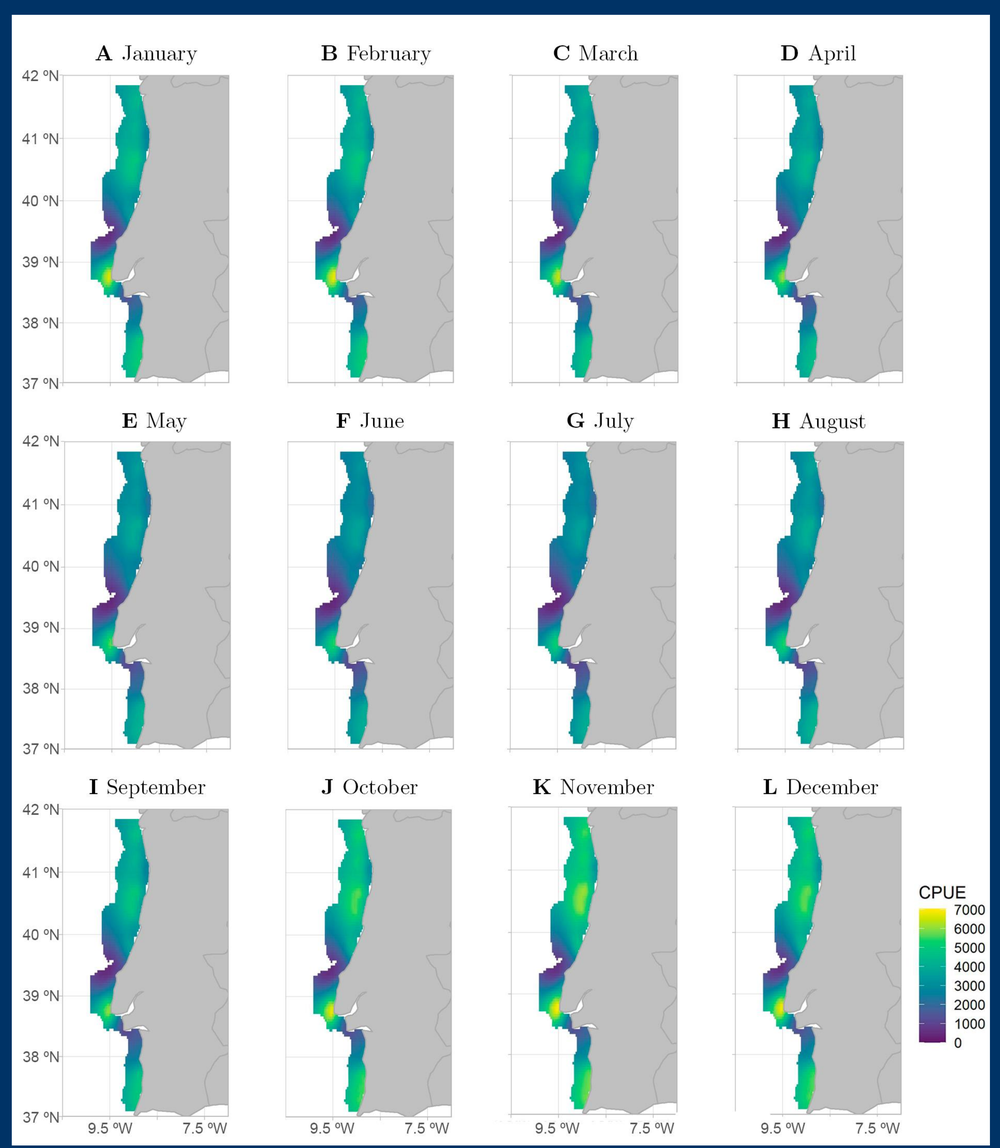
Spatio-temporal structure
Progressive structure monthly effect (spde + AR1) (Paradinas et al., 2017)

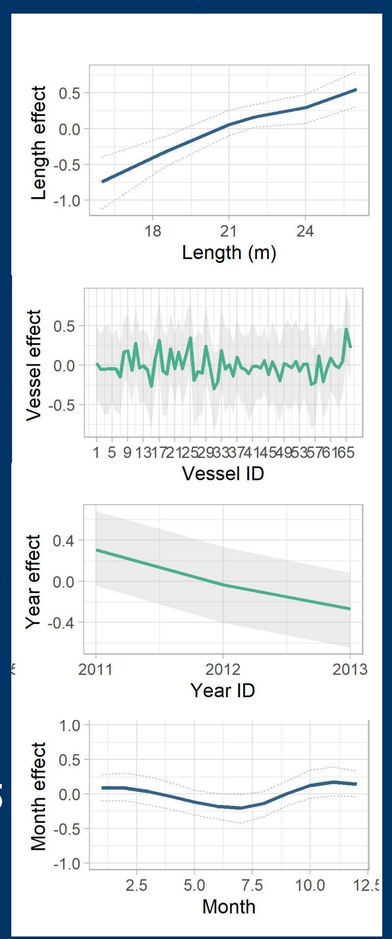
INLA model
R-code in Github: /FranIzquierdo

The dataset consist of combined VMS and Logbook data from vessels > 15 cm (Katara & Silva, 2017) within the period 2011-2013.

Best model selected via DIC, WAIC and LCPO.

~~Region ID, harbour ID, tonnes, engine power, Bathymetry, CHL-a, SST, Intensity, Direction.~~





Conclusions

The use of HBSTM's is a very flexible tool to model CPUE data as it allows to include several variables as different types of random effects.

The 5 environmental variables were not relevant for this particular dataset what can be due to factors such as a small time series.

Including a spatio-temporal term helps to explain the spatial and temporal variability originated by unknown variables/proecesess that are not included in the model.

Maunder, M. N., & Langley, A. D. (2004). Integrating the standardization of catch-per-unit-of-effort into stock assessment models: testing a population dynamics model and using multiple data types. Fisheries Research, 70, 389-395.
Rue, H., Martino, S., & Chopin, N. (2009). Approximate bayesian inference for latent gaussian models by using integrated nested laplace approximations. Journal of the royal statistical society: Series b (statistical methodology), 71, 319-392.
Paradinas, I., Conesa, D., López-Quílez, A., & Bellido, J. M. (2017). Spatio-temporal model structures with shared components for semi-continuous species distribution modelling. Spatial Statistics, 22, 434-450.