Appendix S2

The East Australian Current

A warming western boundary current increases the prevalence of commercially disruptive parasites in broadbill swordfish

Jessica A. Bolin, Karen J. Evans, David S. Schoeman, Claire M. Spillman, Thomas S. Moore II, Jason R. Hartog, Scott F. Cummins & Kylie L. Scales

Fisheries Oceanography

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Section S1: Method

In recognition that the position of the EAC exhibits high spatiotemporal variability on intra-annual timescales, we use a multivariate statistical approach to delineate the core of the EAC (henceforth EAC core). Multivariate analyses have been used to define dynamic habitats within the ETBF, including the EAC (Hobday et al., 2011; Phillips et al., 2022; Li et al., 2022), and are considered more appropriate than using a single 'fixed' variable (e.g., meridional velocity) to define the location of a highly dynamic ocean current.

Briefly, we mapped four variables (i.e., SST, meridional velocity, current speed and sea-surface height anomaly) at a daily temporal resolution and 25-km spatial resolution across the study domain. Visual inspection of all maps indicated that the four environmental variables were spatially correlated, so we used PCA to extract patterns simultaneously across all variables. To represent the EAC core, we extracted the first principal component (PC1) from each daily PCA, since it explained the most variance. The EAC is characterised by high values of SST, SSHa, speed, and southwards flow, compared to the surrounding oceanography, so we use the maximum value of PC1 at any given latitude as a proxy for the EAC core (see Appendix 2: Figure S1).

The position of the maximum value of PC1 was then extracted at the latitude of each shot, and distance between the two were calculated using the geosphere package. The average distance for each boat trip (comprising multiple shots) was then calculated. We also recorded the variance explained by PC1 for each day. If this value was high, the EAC was well-resolved over the study domain. We experimented using a different combination of variables (see Appendix 2: Section 2), but the four used above yielded the greatest mean variance.

Input data were configured to increase at the EAC core, so positive loadings of the variables onto PC1 suggests that the PC1 values increase as the input values increase. If the variable loadings were all negative, they were multiplied by -1 to ensure consistency of interpretation (Bolin et al., 2020). When the signs of the loadings did not concur (often due to outliers in input variables), the PCA was recorded as a 'failure' and manually corrected.

Section S2: Results

We created daily surfaces of the EAC core in the ETBF domain for the duration of our study period by extracting the first principal component of the PCA, because it explained the most variance. Compared to the method in Bolin et al 2020, including SSHa in the PCA increased the overall mean variance, and only marginally affected the hit rate (see Appendix 2: Table S1). Therefore, we included SSHa in the PCA.

Figure S1

Example daily surface of PC1 for 2020-12-09. The EAC is depicted by the high values of PC1 adjacent to the Australian east coast (red colour).

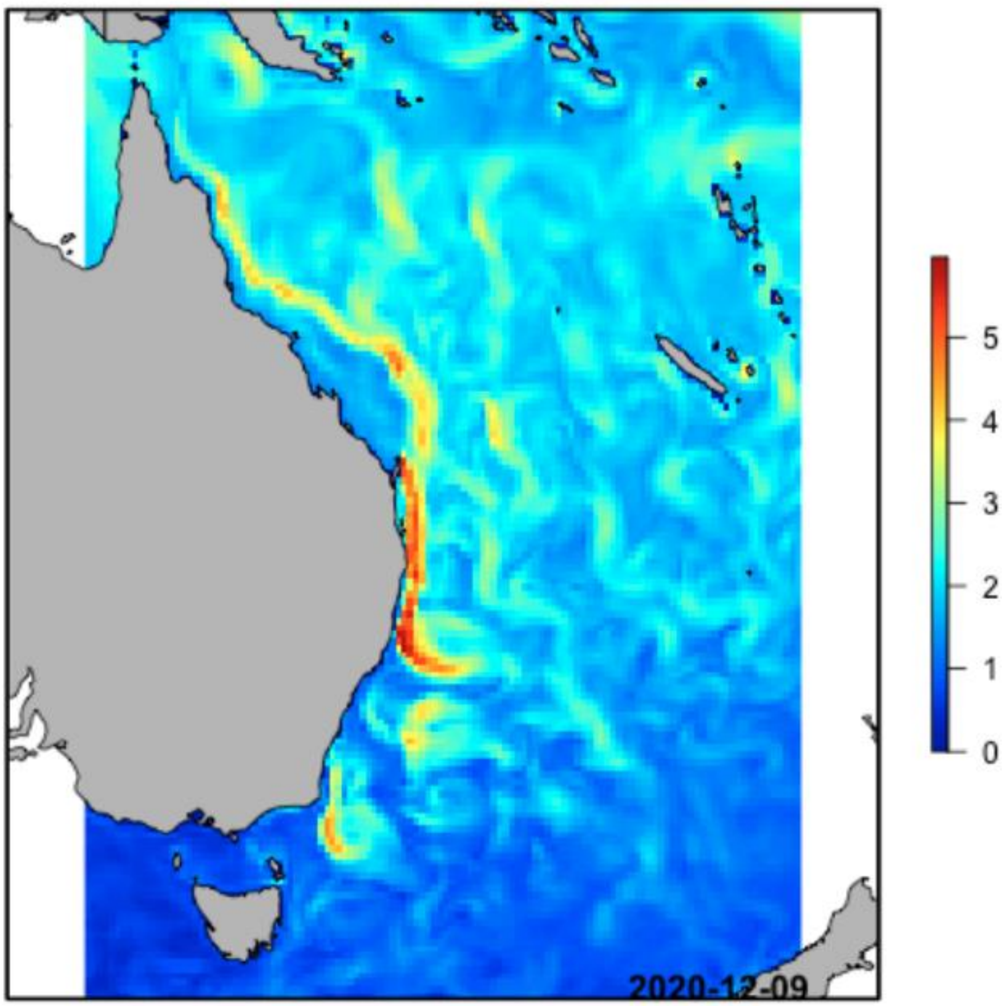

Table S1

Algorithm results. [1]Method used in Bolin et al., 2020

		Variance (PC1)		
Variable combination	Hit rate (#shots with inversed loadings)	Mean +/- SD	Median	Range
SST, V, Speed[1]	92.47% (21/279)	0.64 +/- 0.04	0.64	0.58 – 0.75
SST, V, Speed, SSHa	91.75% (23/279)	0.7 +/- 0.02	0.7	0.66 – 0.76

References

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