

Supplement

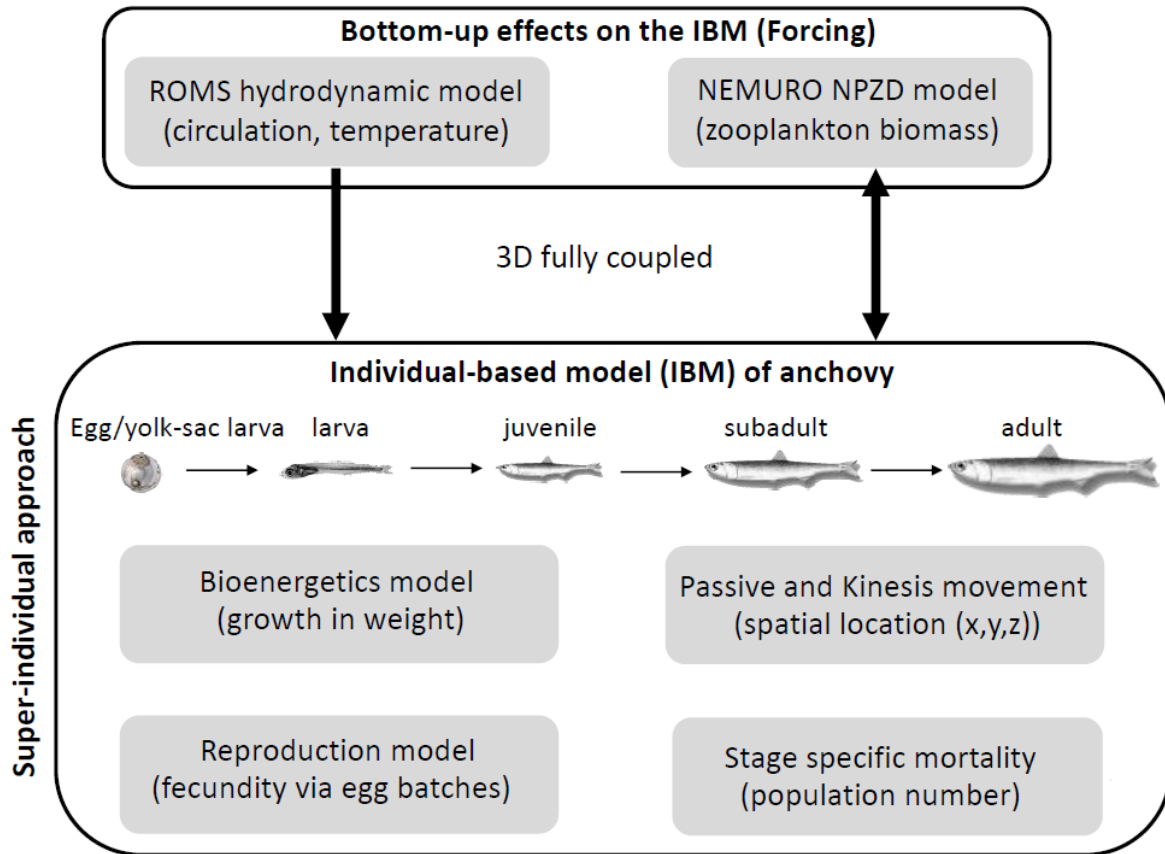


Fig. S1. Schematic diagram of the fully coupled 3-dimensional end-to-end model, showing the coupling of the ROMS, NEMURO NPZD, and IBM submodels used for simulating anchovy population dynamics. The fourth submodel of the fishing fleet is not shown, because harvest of anchovy was assumed low during the simulation period. The IBM of anchovy tracked super-individuals as they progressed through the life stages of egg, yolk-sac larval, larval, juvenile, subadult, and adult stages. Temperature from ROMS affected growth and movement, and growth depended on the feeding of the anchovy upon the zooplankton groups generated by the NEMURO NPZD submodel.

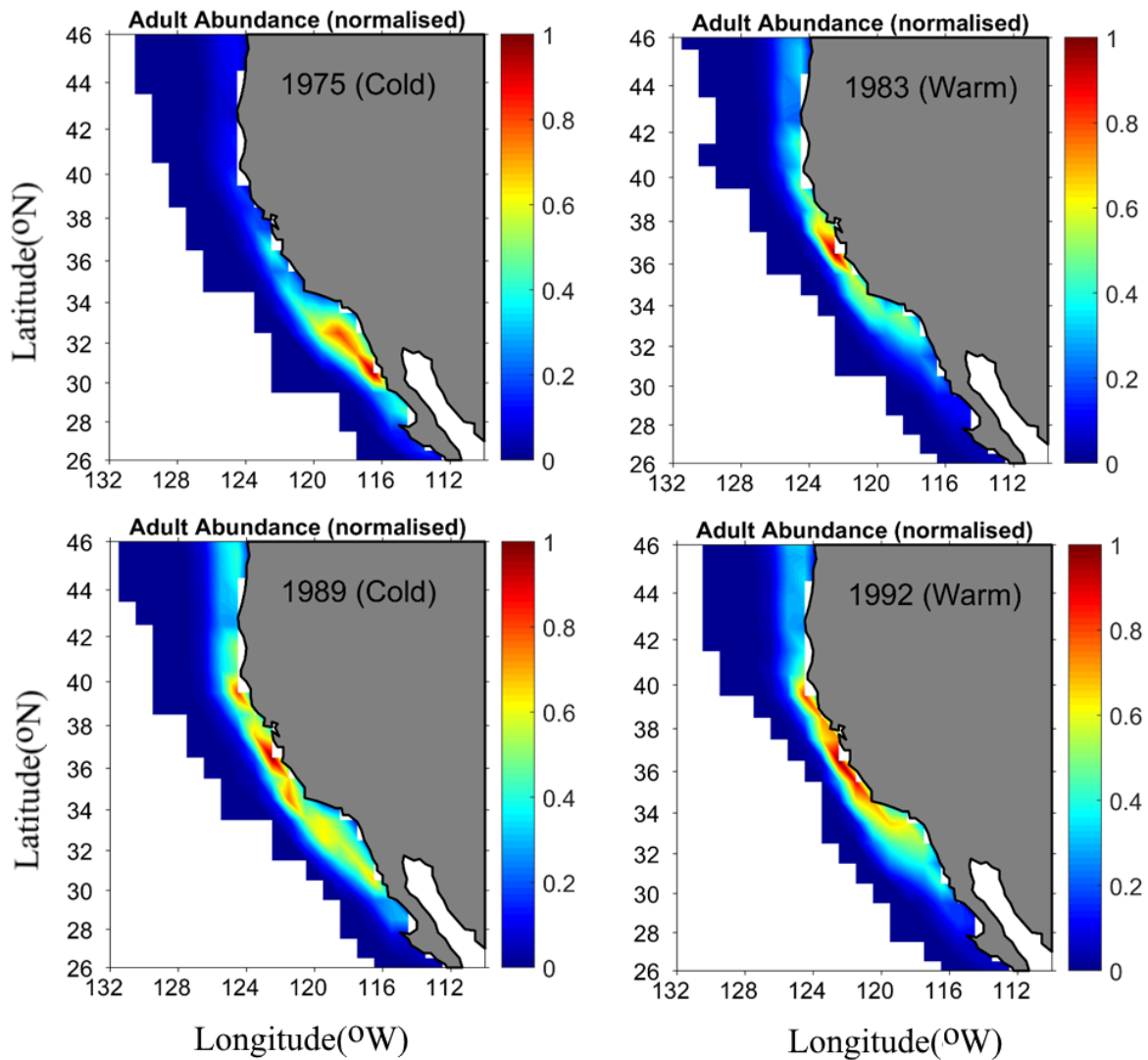


Fig. S2. Annual maps of adult abundance for two warm years (1983, 1992) and two cold years (1975, 1989). The grid cells of the maps are normalized to [0-1] scale using the formula $X_{norm,cell} = \left(X_{cell} - \min_{all-cells} X \right) / \left(\max_{all-cells} X - \min_{all-cells} X \right)$. The normalization process was applied for each year separately.

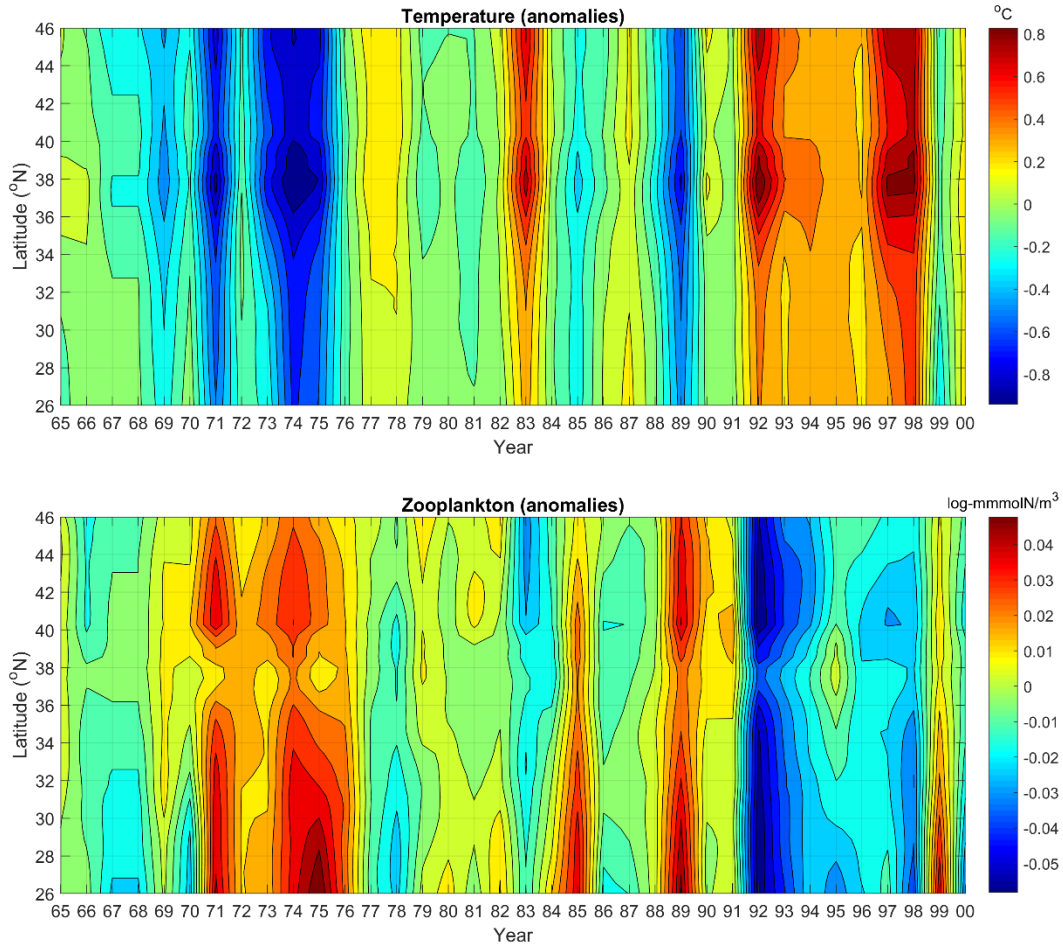


Fig. S3. Temperature and zooplankton difference anomalies plotted as latitude-by-years from the NEMURO NPZD model and averaged over the area of anchovy habitat (<1000 m depth). Anomalies were computed by removing the 1965-2000 mean per latitude level.

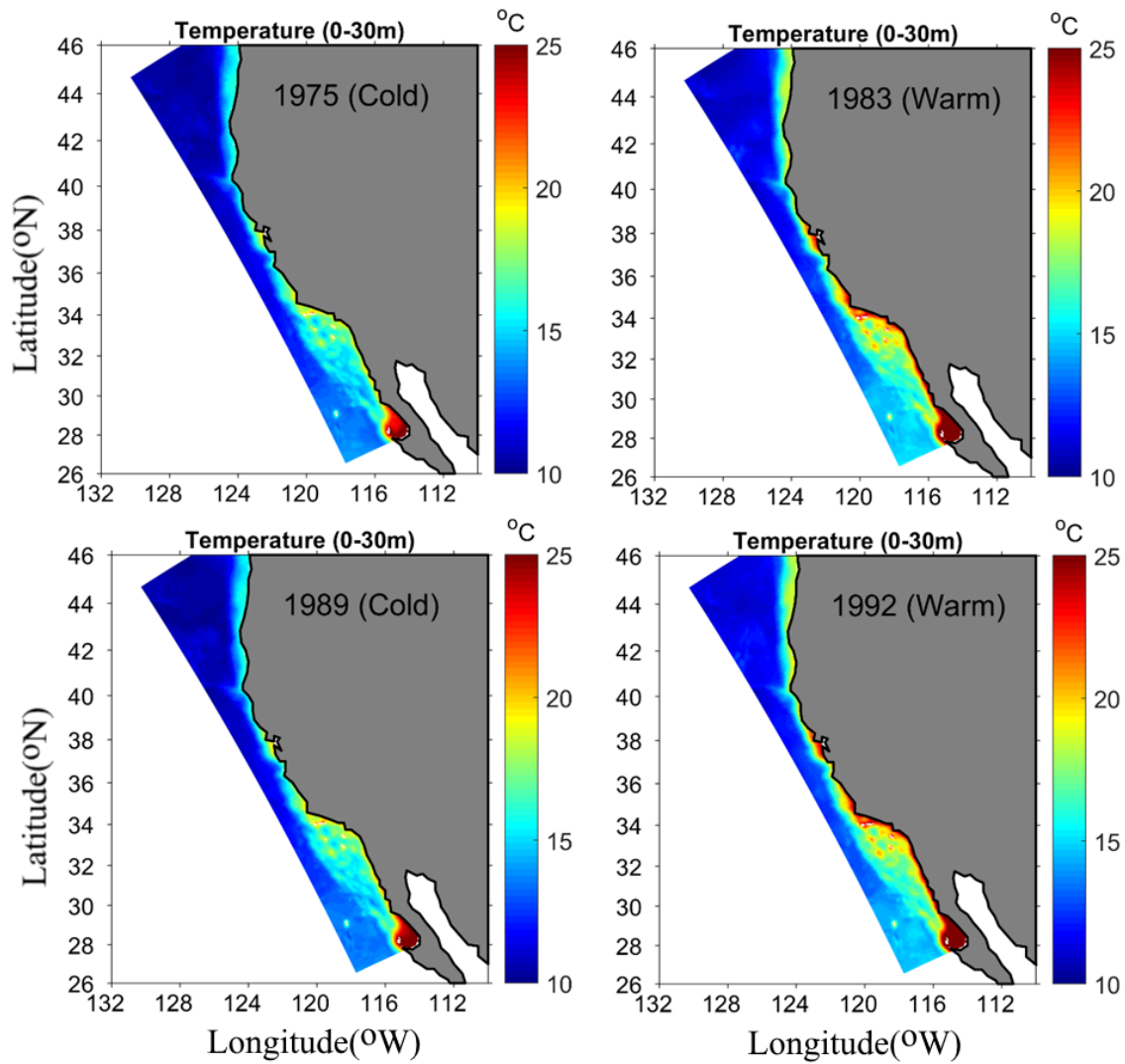


Fig. S4. Annual maps of temperature for two warm years (1983, 1992) and two cold years (1975, 1989) years from the NEMURO NPZD model and averaged for anchovy habitat (<1000 m depth).

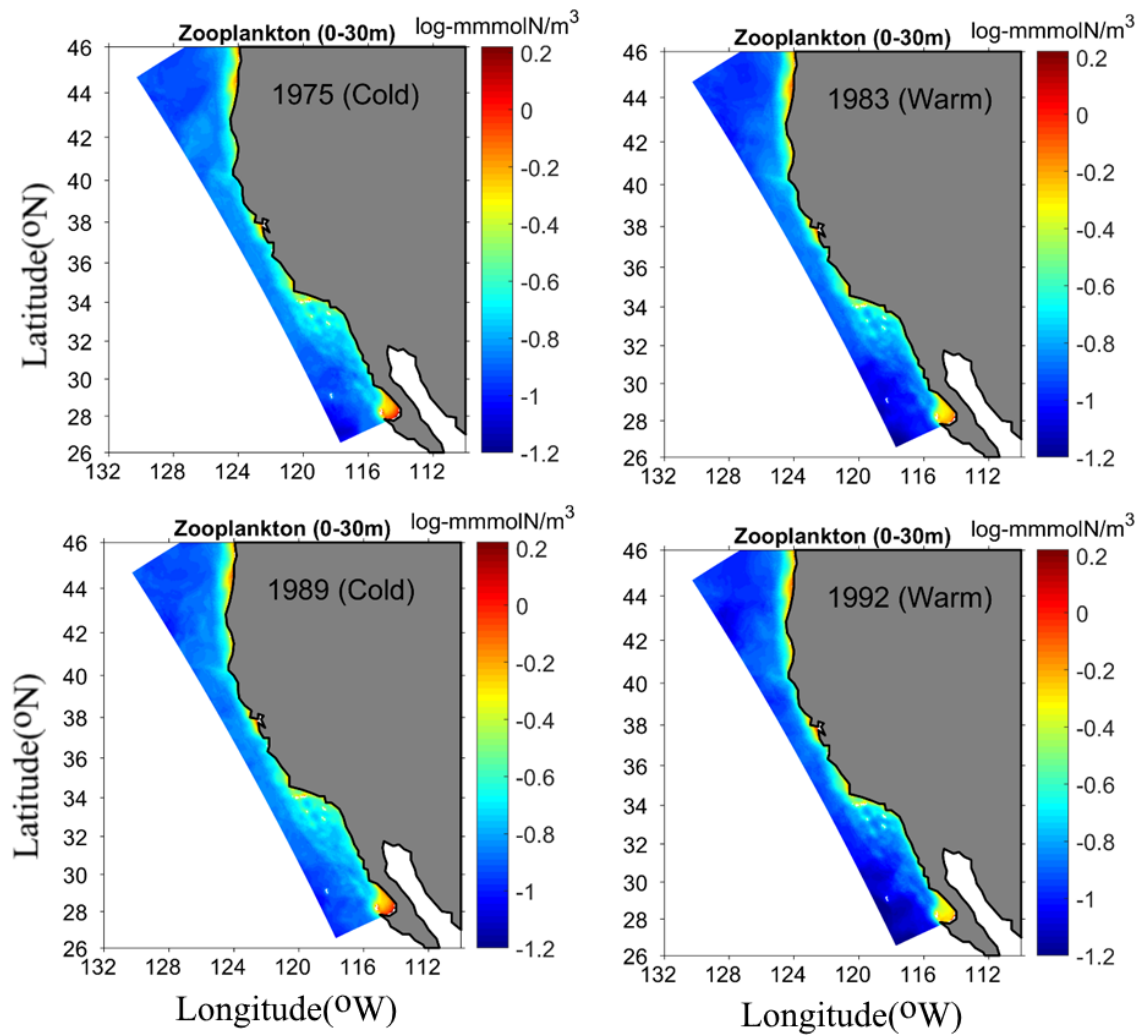


Fig. S5. Annual maps of zooplankton for two warm years (1983, 1992) and two cold years (1975, 1989) from the NEMURO NPZD model and averaged for anchovy habitat (<1000 m depth).

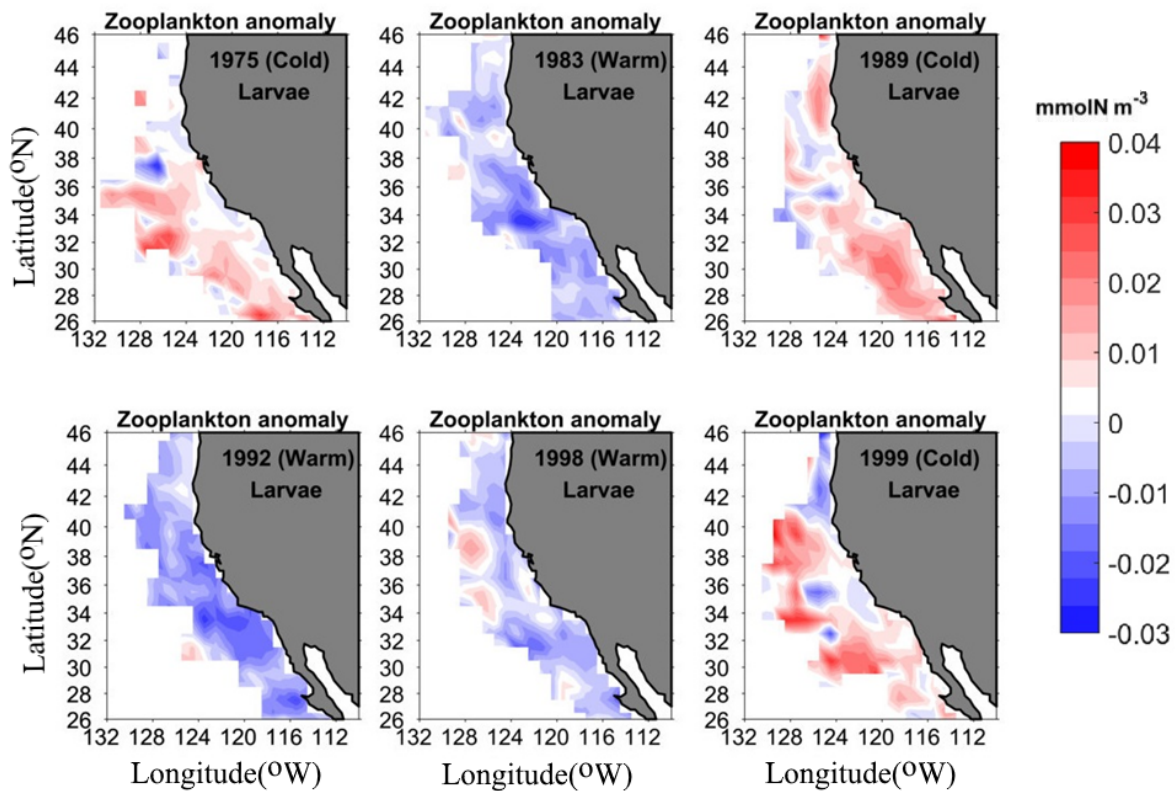


Fig. S6. Difference anomalies of averaged zooplankton concentrations experienced by larvae for the warm years (1983, 1992, 1998) and cold years (1975, 1989, 1999). Anomalies were computed by removing the 1965-2000 mean.

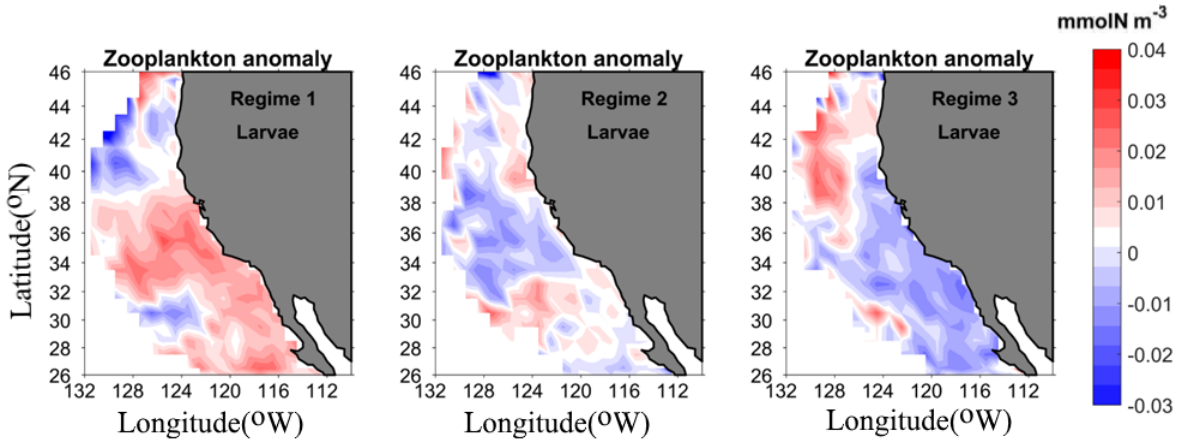


Fig. S7. Difference anomalies of averaged zooplankton (sum of SZ and LZ, main prey of larvae) experienced by larvae for the regimes 1, 2, and 3 (left to right). Anomalies were computed by removing the 1965-2000 mean.