Supporting Information

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SI Text

Ecosystem State. The study period (1974–2005) is characterized by low population levels of the piscivore mammals (gray seal *Halichoerus grypus*, ringed seal *Phoca hispida*, common seal *Phoca vitulina,* and harbor porpoises *Phocoena phocoena*), which were abundant at the beginning of the 1900s but which decreased drastically afterward because of human activities (1). Therefore, in our study period, cod has been by far the main top predator in the central Baltic Sea. We focused on the past 3 decades because they encompass the period of cod and sprat analytical stock assessment estimates (2, 3) as well as of regular field measurement for the zooplankton.

Season Considered. The seasonality in biological and ecological features, characteristic of temperate environments, implies the occurrence of season-specific trophic interactions (4, 5), which could be masked if annual averages were used. Therefore, we used summer zooplankton data in the analyses, because we assumed that top-down regulation, if existing, would be discovered mostly during the summer period, coinciding with the peak of clupeid feeding intensity (6, 7) and zooplankton production (8). Sprat, however, can exercise a strong predation pressure on *Pseudocalanus* spp. also in spring (9), when the stock of this plankter highly exceeds the other zooplankton species, which mostly reproduce later in the season (8).

Survival of Cod Eggs and Larvae. Cod egg survival is related to the volume of water with salinity >11 psu and oxygen level >2 ml·l^{-1} [reproductive volume (10), see *Materials and Methods*]. These conditions are mostly associated with the inflow of salt- and oxygen-rich waters from the North Sea. Accordingly, cod recruitment success decreased since the early 1980s, following a drop in its reproductive volume (Fig. 4*B*). However, some intense water inflows from the North Sea created favorable reproductive conditions for cod (i.e., large reproductive volume) also after the early 1990s (Fig. 4*B*). As a consequence, egg survival increased, but this did not translate into the expected increase in larval survival, likely because of lack of food supply (9).

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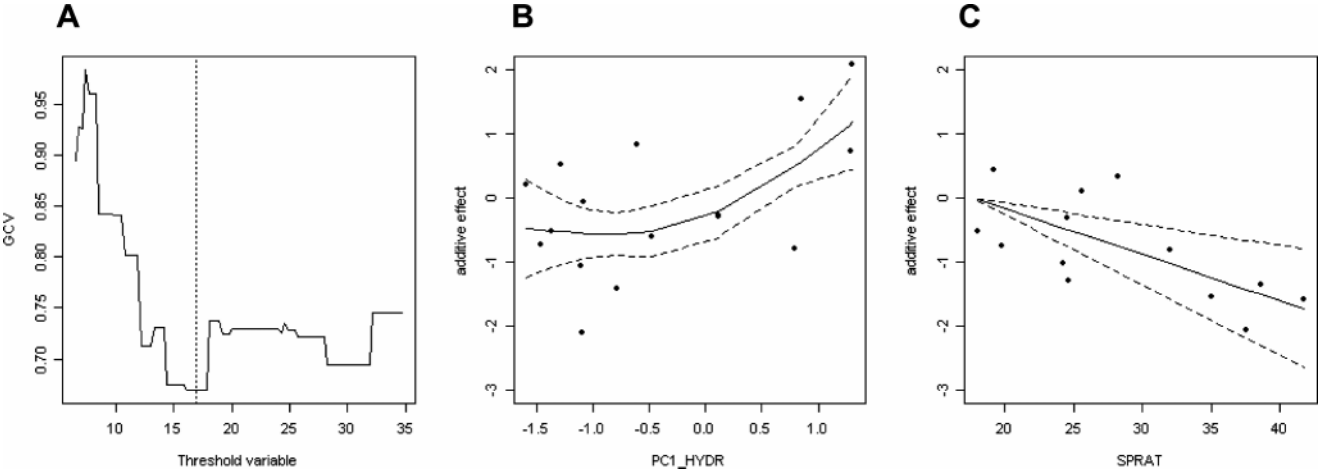

Fig. S1. Results of the TGAM analysis. (*A*) Profile of the GCV score as a function of the threshold variable (sprat abundance). The vertical dotted line corresponds to the threshold selected by the TGAM (16.98×10^{10} sprat individuals) and separating the 2 configurations. (*B* and *C*) Effect of hydrological conditions and sprat abundance on PC1 of zooplankton below and above the threshold, respectively. Solid lines indicate smoothed nonparametric trends, and dashed lines represent 95% confidence intervals. For the statistics of the TGAM, see Table S3.

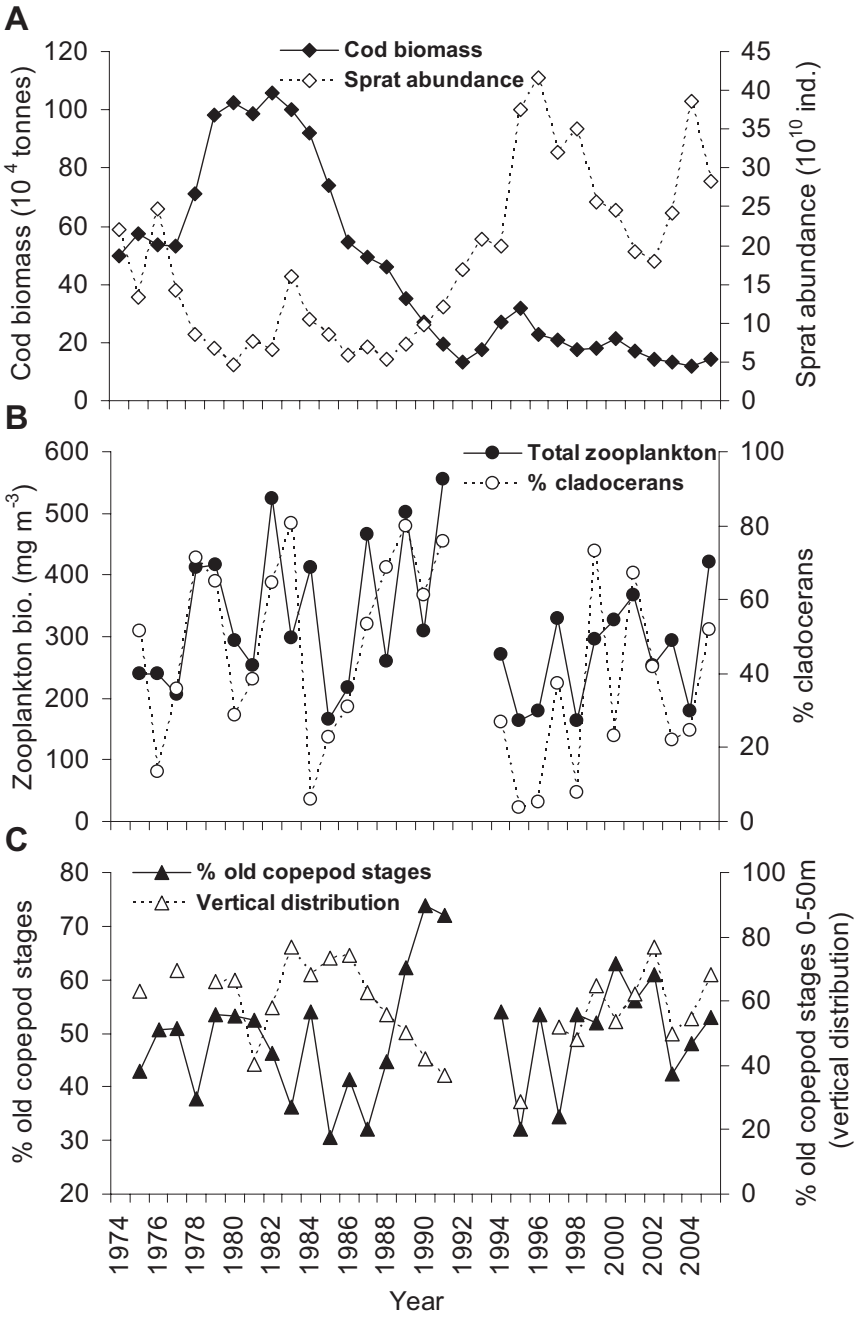

Fig. S2. Biotic raw data used in the study. (A) Time series of cod biomass and sprat abundance. (*B* and *C*) Summer zooplankton parameters. Fish data were extracted from assessment reports (2), whereas raw zooplankton data were provided by the Latvian Fish Resources Agency. See *Materials and Methods* for details.

Other Supporting Information Files

Table S1 (PDF)
Table S2 (PDF)
Table S3 (PDF)
Table S4 (PDF)