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Supplement of

A novel multispecies approach for the detection of regime shifts in a plankton community – a case study in the North Sea

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Supplementary Material

S1 Area C1

As the window length increases from 6 to 54 months, the timing of predicted regime shifts in area C1 did not change. The difference between the percentage likelihood of a regime shift during regime shifts was smaller with a longer window length compared to a window length of 24 months or less. The beginning of the time series remained very low for 12-24 months when the window length was less than 24 months. When the window length was 36 months or longer the beginning of the time series exhibited a steady increase.

S2 Area C2

As the window length increases from 6 to 54 months, the timing of most predicted regime shifts in area C2 did not change. The difference between the percentage likelihood of a regime shift during regime shifts was smaller with a longer window length compared to a window length of 24 months or less. When the window length was increased to 30 months two additional regime shifts were predicted after 30 months. As the window length was increased, one regime shift prediction remained at 30 months and one moved with the number of months the window length was increased by.

S3 Area D1

As the window length increases from 6 to 54 months, the timing of predicted regime shifts in area D1 did not change. The difference between the percentage likelihood of a regime shift during regime shifts became smaller as the window length increased.

S4 Area D2

As the window length increases from 6 to 54 months, the timing of predicted regime shifts in area D2 did not change. The difference between the percentage likelihood of a regime shift during regime shifts was smaller with a longer window length compared to a window length of 24 months or less. The beginning of the time series remained very low for 12-24 months when the window length was

less than 24 months. When the window length was 36 months or longer the beginning of the time series exhibited a steady increase.

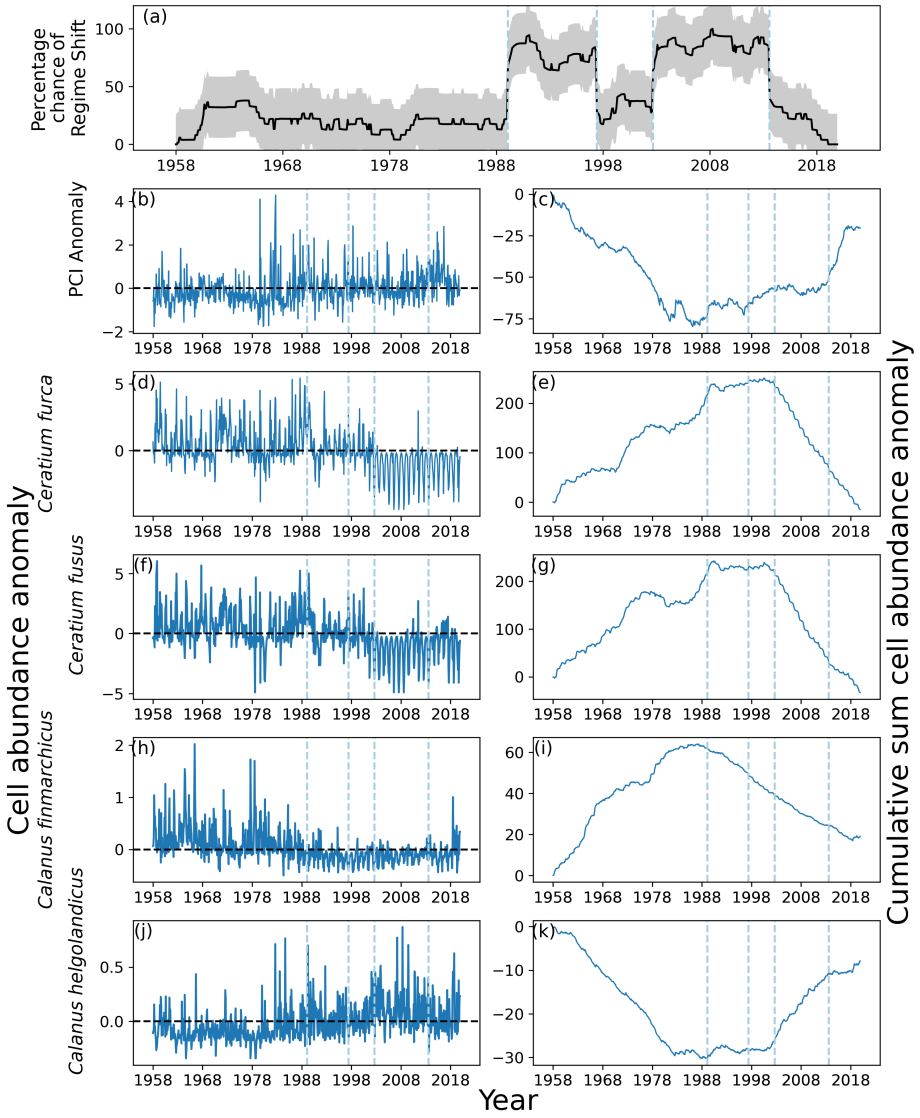

Figure S1: (a) Percentage likelihood of regime shift as estimated by the RST model for Area C1 (see Fig. 1 and 9 from original paper), located between 54° and 58° North and 3° and 12° East; (b) monthly mean anomaly and (c) cumulative sum of PCI; (d) monthly mean anomaly and (e) cumulative sum of phytoplankton species abundance exhibiting greatest range; (f) monthly mean anomaly and (g) cumulative sum of phytoplankton species abundance exhibiting second greatest range; (h) monthly mean anomaly and (i) cumulative sum of *Calanus finmarchicus*; and (j) monthly mean anomaly and (k) cumulative sum of *C. helgolandicus*. A window length of 6 months was used in Eq. 5.

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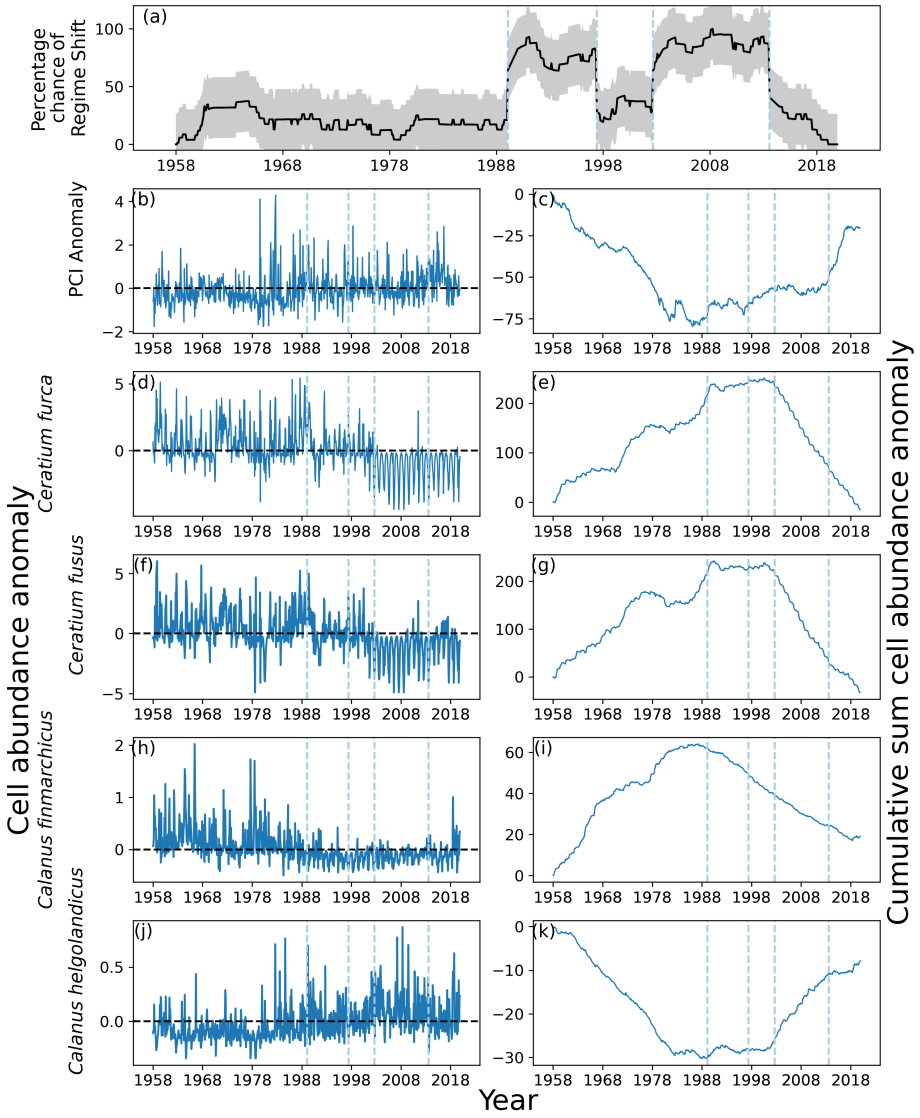

Figure S2: (a) Percentage likelihood of regime shift as estimated by the RST model for Area C1 (see Fig. 1 and 9 from original paper), located between 54° and 58° North and 3° and 12° East; (b) monthly mean anomaly and (c) cumulative sum of PCI; (d) monthly mean anomaly and (e) cumulative sum of phytoplankton species abundance exhibiting greatest range; (f) monthly mean anomaly and (g) cumulative sum of phytoplankton species abundance exhibiting second greatest range; (h) monthly mean anomaly and (i) cumulative sum of *Calanus finmarchicus*; and (j) monthly mean anomaly and (k) cumulative sum of *C. helgolandicus*. A window length of 12 months was used in Eq. 5.

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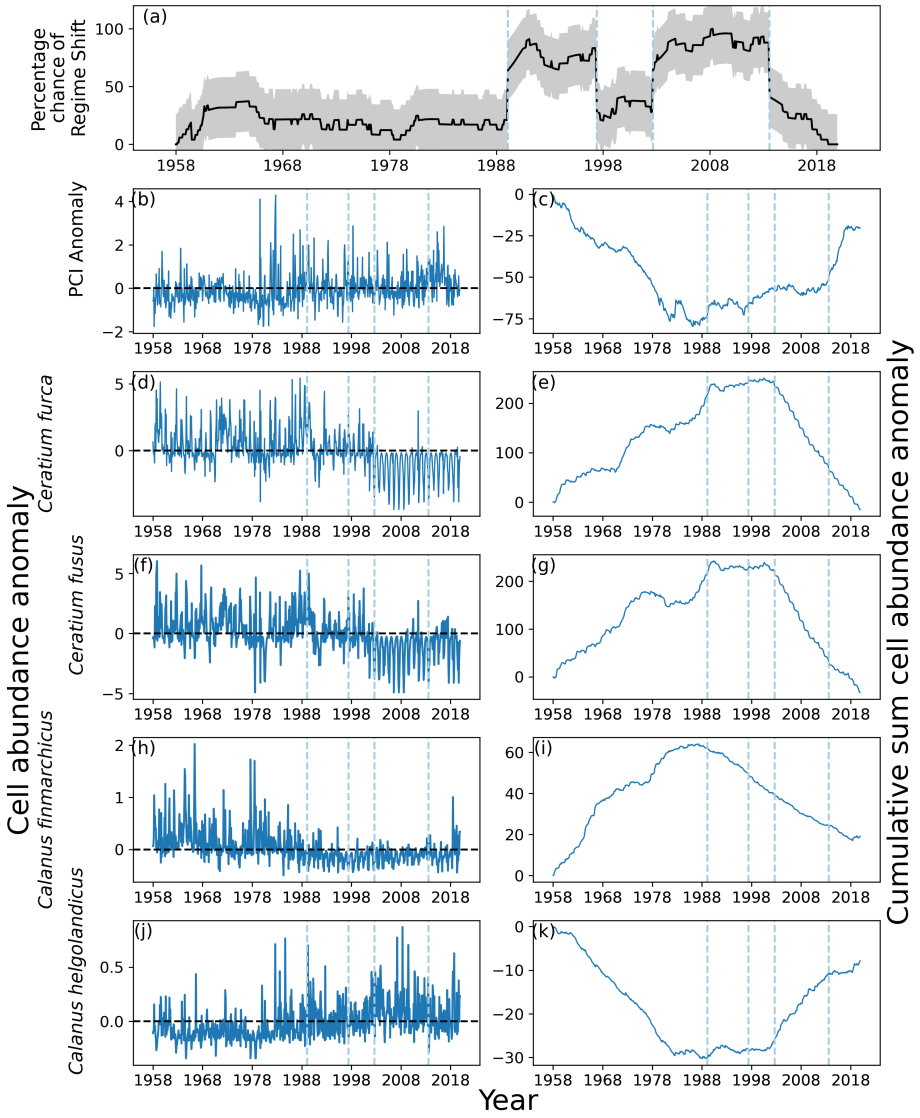

Figure S3: (a) Percentage likelihood of regime shift as estimated by the RST model for Area C1 (see Fig. 1 and 9 from original paper), located between 54° and 58° North and 3° and 12° East; (b) monthly mean anomaly and (c) cumulative sum of PCI; (d) monthly mean anomaly and (e) cumulative sum of phytoplankton species abundance exhibiting greatest range; (f) monthly mean anomaly and (g) cumulative sum of phytoplankton species abundance exhibiting second greatest range; (h) monthly mean anomaly and (i) cumulative sum of *Calanus finmarchicus*; and (j) monthly mean anomaly and (k) cumulative sum of *C. helgolandicus*. A window length of 18 months was used in Eq. 5.

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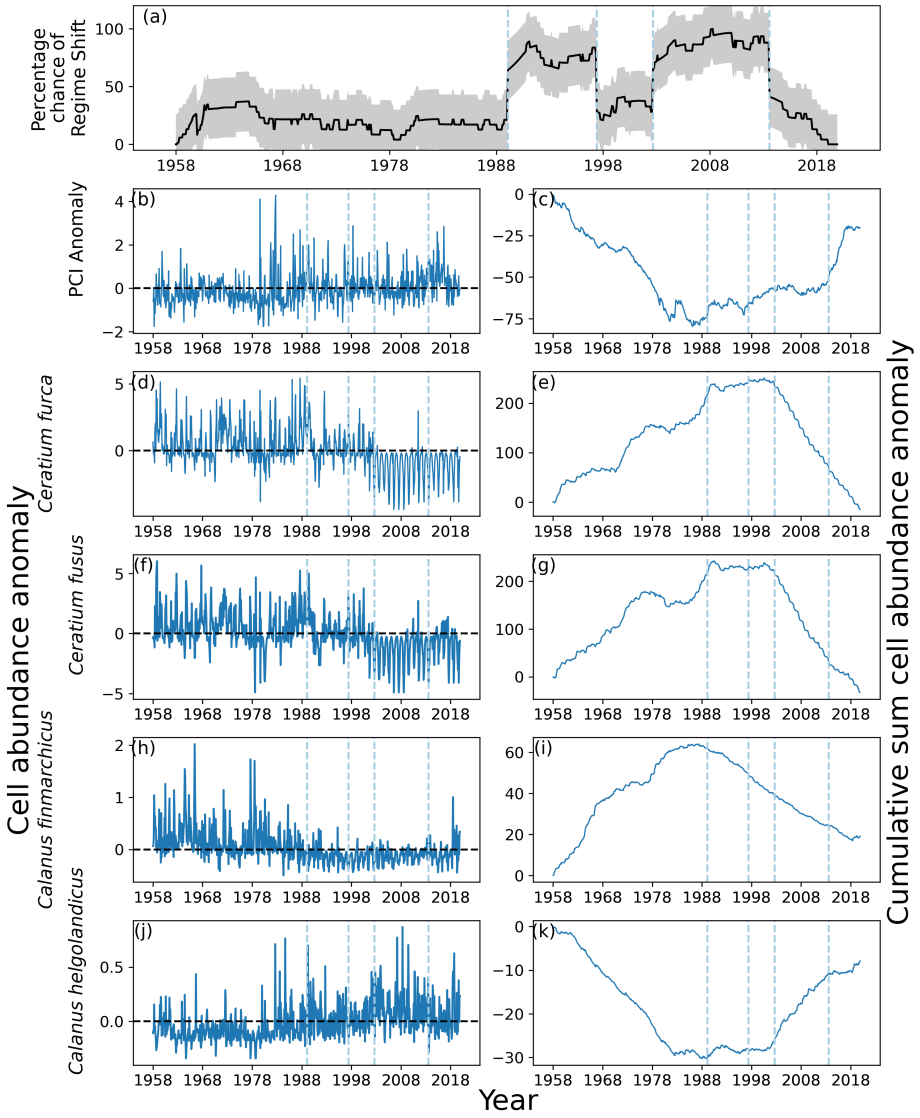

Figure S4: (a) Percentage likelihood of regime shift as estimated by the RST model for Area C1 (see Fig. 1 and 9 from original paper), located between 54° and 58° North and 3° and 12° East; (b) monthly mean anomaly and (c) cumulative sum of PCI; (d) monthly mean anomaly and (e) cumulative sum of phytoplankton species abundance exhibiting greatest range; (f) monthly mean anomaly and (g) cumulative sum of phytoplankton species abundance exhibiting second greatest range; (h) monthly mean anomaly and (i) cumulative sum of *Calanus finmarchicus*; and (j) monthly mean anomaly and (k) cumulative sum of *C. helgolandicus*. A window length of 24 months was used in Eq. 5.

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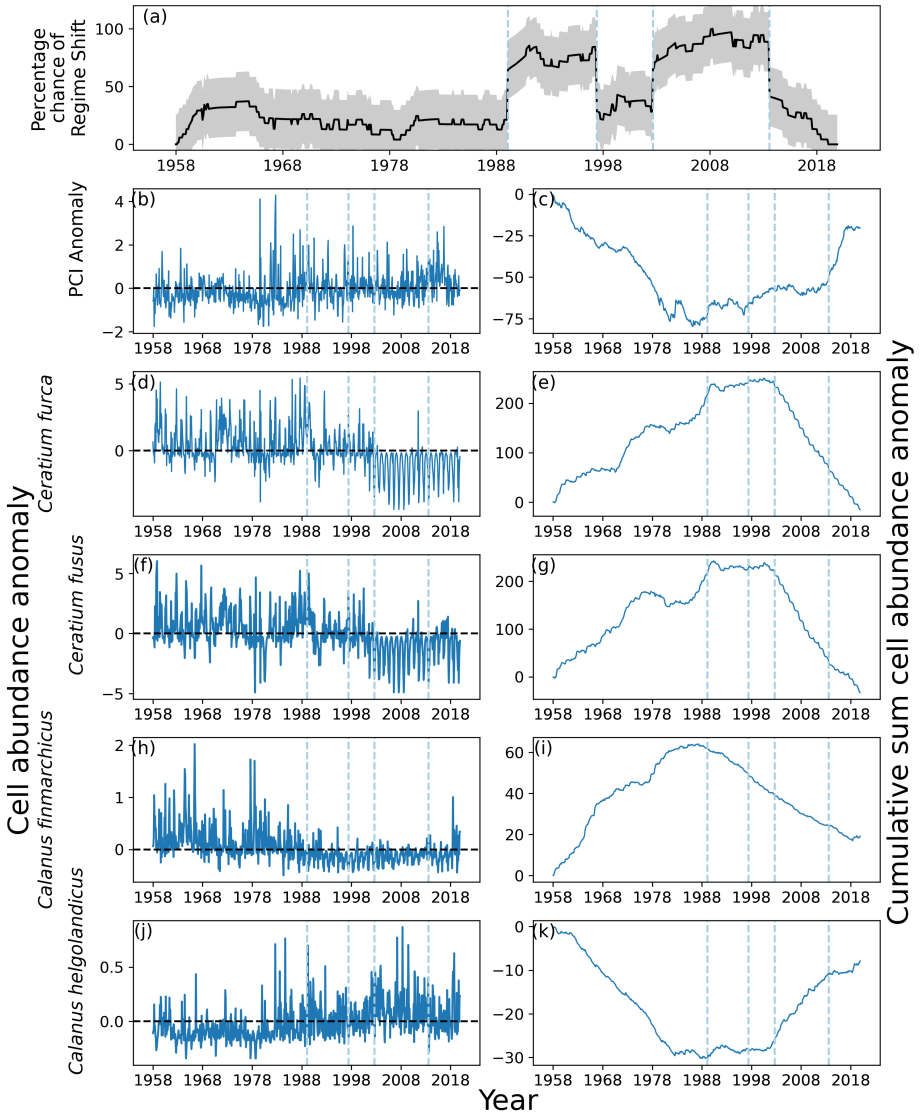

Figure S5: (a) Percentage likelihood of regime shift as estimated by the RST model for Area C1 (see Fig. 1 and 9 from original paper), located between 54° and 58° North and 3° and 12° East; (b) monthly mean anomaly and (c) cumulative sum of PCI; (d) monthly mean anomaly and (e) cumulative sum of phytoplankton species abundance exhibiting greatest range; (f) monthly mean anomaly and (g) cumulative sum of phytoplankton species abundance exhibiting second greatest range; (h) monthly mean anomaly and (i) cumulative sum of *Calanus finmarchicus*; and (j) monthly mean anomaly and (k) cumulative sum of *C. helgolandicus*. A window length of 30 months was used in Eq. 5.

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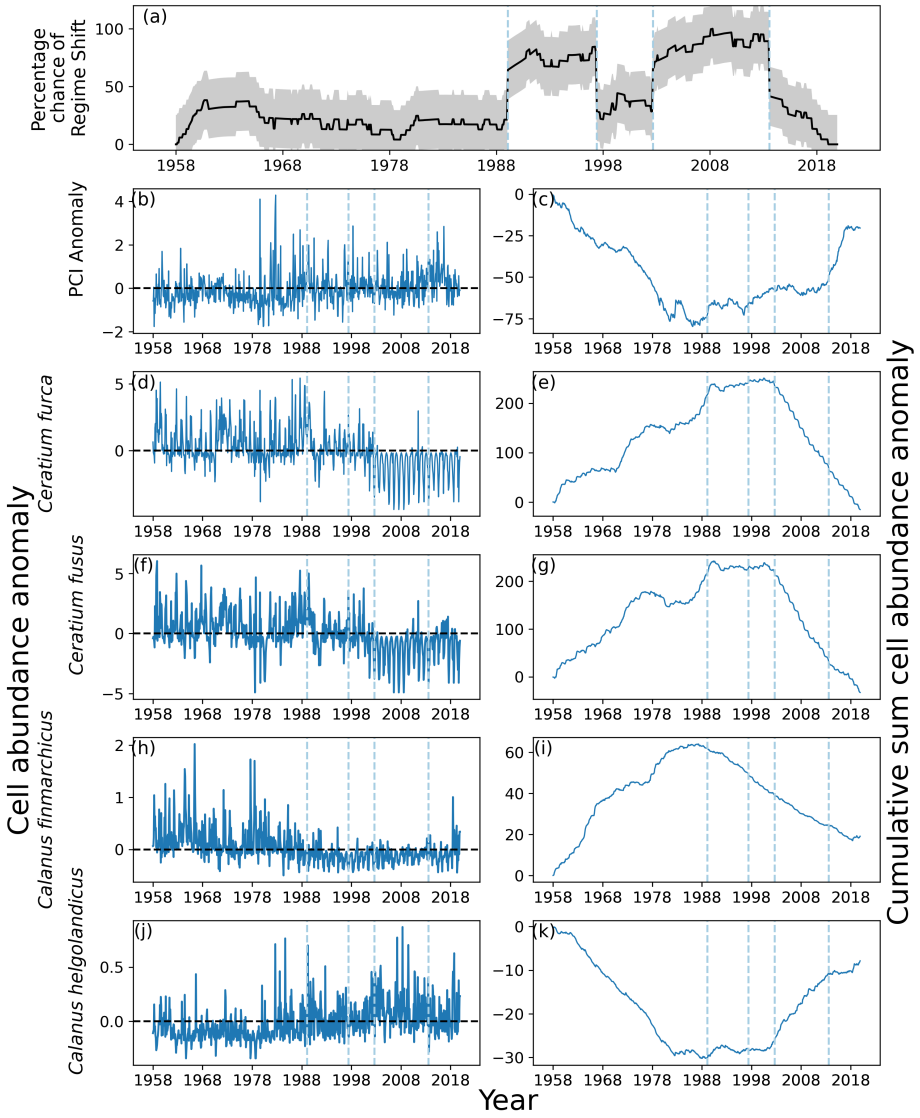

Figure S6: (a) Percentage likelihood of regime shift as estimated by the RST model for Area C1 (see Fig. 1 and 9 from original paper), located between 54° and 58° North and 3° and 12° East; (b) monthly mean anomaly and (c) cumulative sum of PCI; (d) monthly mean anomaly and (e) cumulative sum of phytoplankton species abundance exhibiting greatest range; (f) monthly mean anomaly and (g) cumulative sum of phytoplankton species abundance exhibiting second greatest range; (h) monthly mean anomaly and (i) cumulative sum of *Calanus finmarchicus*; and (j) monthly mean anomaly and (k) cumulative sum of *C. helgolandicus*. A window length of 36 months was used in Eq. 5.

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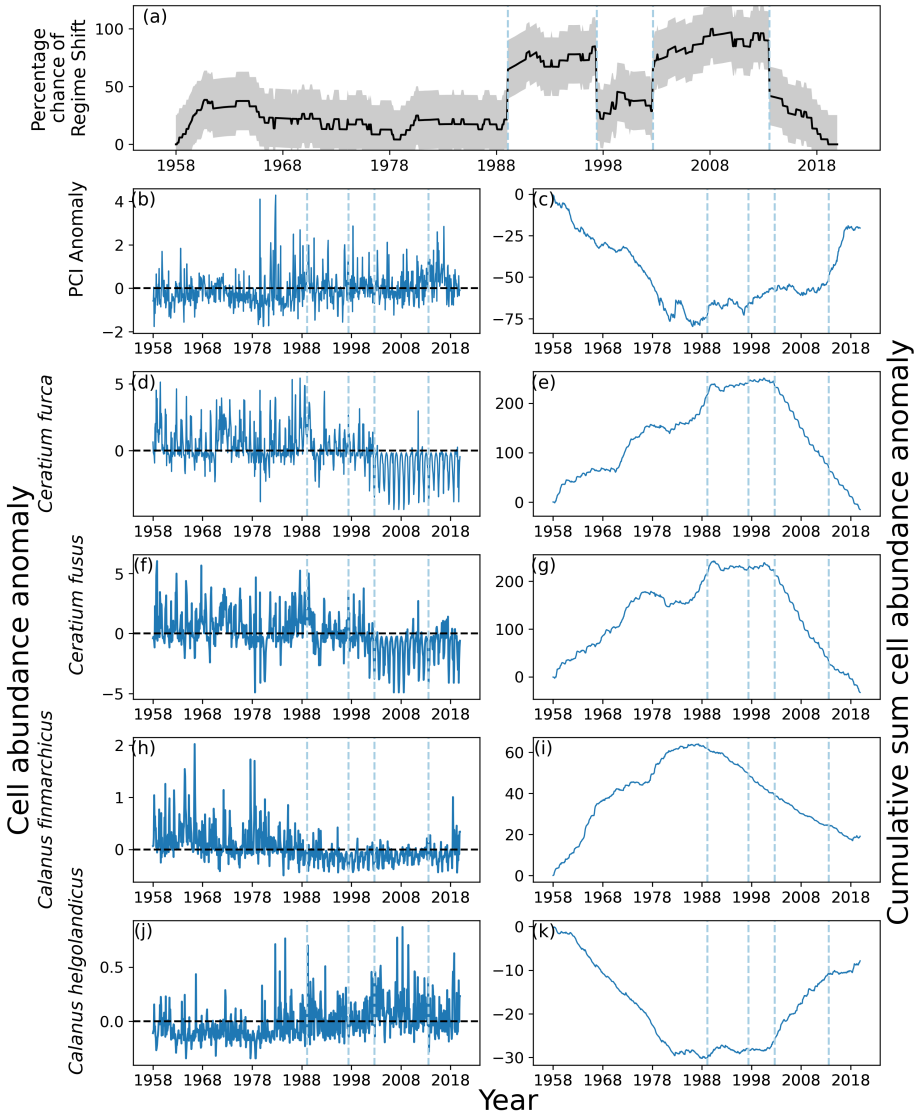

Figure S7: (a) Percentage likelihood of regime shift as estimated by the RST model for Area C1 (see Fig. 1 and 9 from original paper), located between 54° and 58° North and 3° and 12° East; (b) monthly mean anomaly and (c) cumulative sum of PCI; (d) monthly mean anomaly and (e) cumulative sum of phytoplankton species abundance exhibiting greatest range; (f) monthly mean anomaly and (g) cumulative sum of phytoplankton species abundance exhibiting second greatest range; (h) monthly mean anomaly and (i) cumulative sum of *Calanus finmarchicus*; and (j) monthly mean anomaly and (k) cumulative sum of *C. helgolandicus*. A window length of 42 months was used in Eq. 5.

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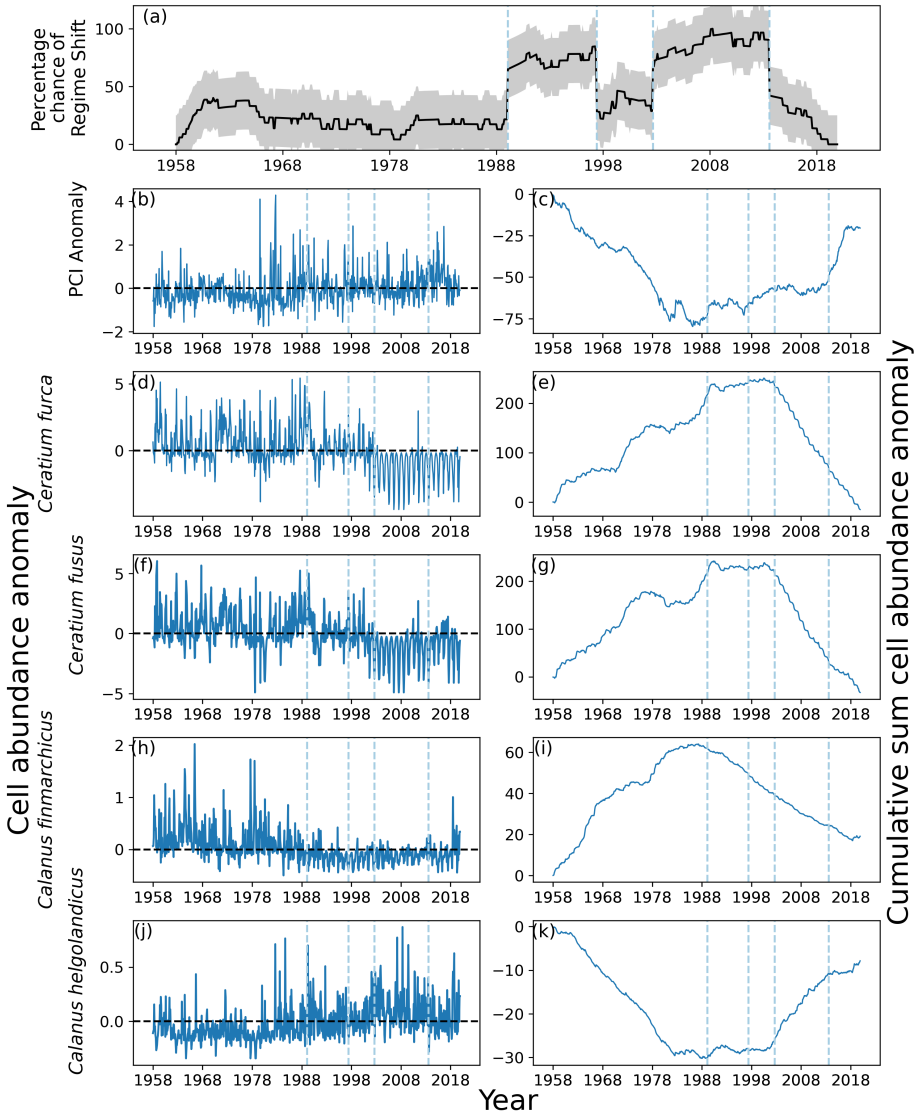

Figure S8: (a) Percentage likelihood of regime shift as estimated by the RST model for Area C1 (see Fig. 1 and 9 from original paper), located between 54° and 58° North and 3° and 12° East; (b) monthly mean anomaly and (c) cumulative sum of PCI; (d) monthly mean anomaly and (e) cumulative sum of phytoplankton species abundance exhibiting greatest range; (f) monthly mean anomaly and (g) cumulative sum of phytoplankton species abundance exhibiting second greatest range; (h) monthly mean anomaly and (i) cumulative sum of *Calanus finmarchicus*; and (j) monthly mean anomaly and (k) cumulative sum of *C. helgolandicus*. A window length of 48 months was used in Eq. 5.

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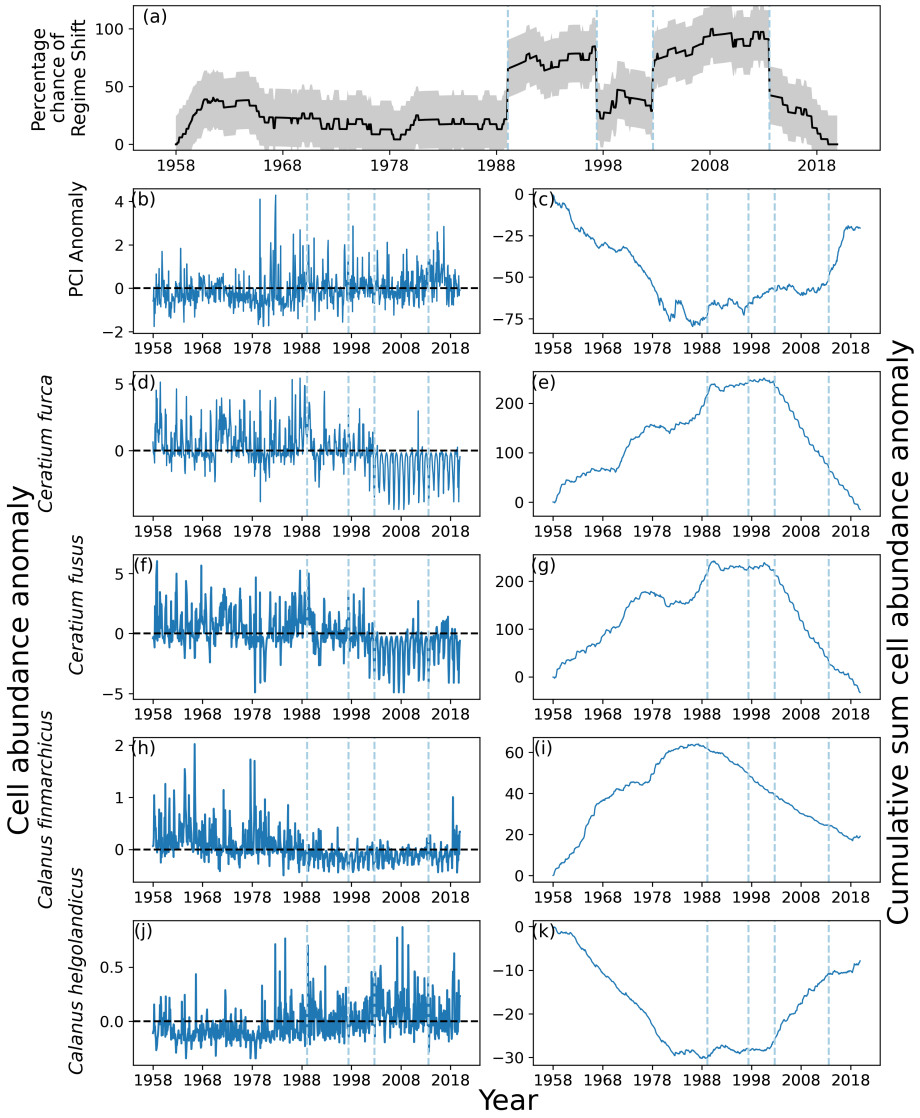

Figure S9: (a) Percentage likelihood of regime shift as estimated by the RST model for Area C1 (see Fig. 1 and 9 from original paper), located between 54° and 58° North and 3° and 12° East; (b) monthly mean anomaly and (c) cumulative sum of PCI; (d) monthly mean anomaly and (e) cumulative sum of phytoplankton species abundance exhibiting greatest range; (f) monthly mean anomaly and (g) cumulative sum of phytoplankton species abundance exhibiting second greatest range; (h) monthly mean anomaly and (i) cumulative sum of *Calanus finmarchicus*; and (j) monthly mean anomaly and (k) cumulative sum of *C. helgolandicus*. A window length of 54 months was used in Eq. 5.

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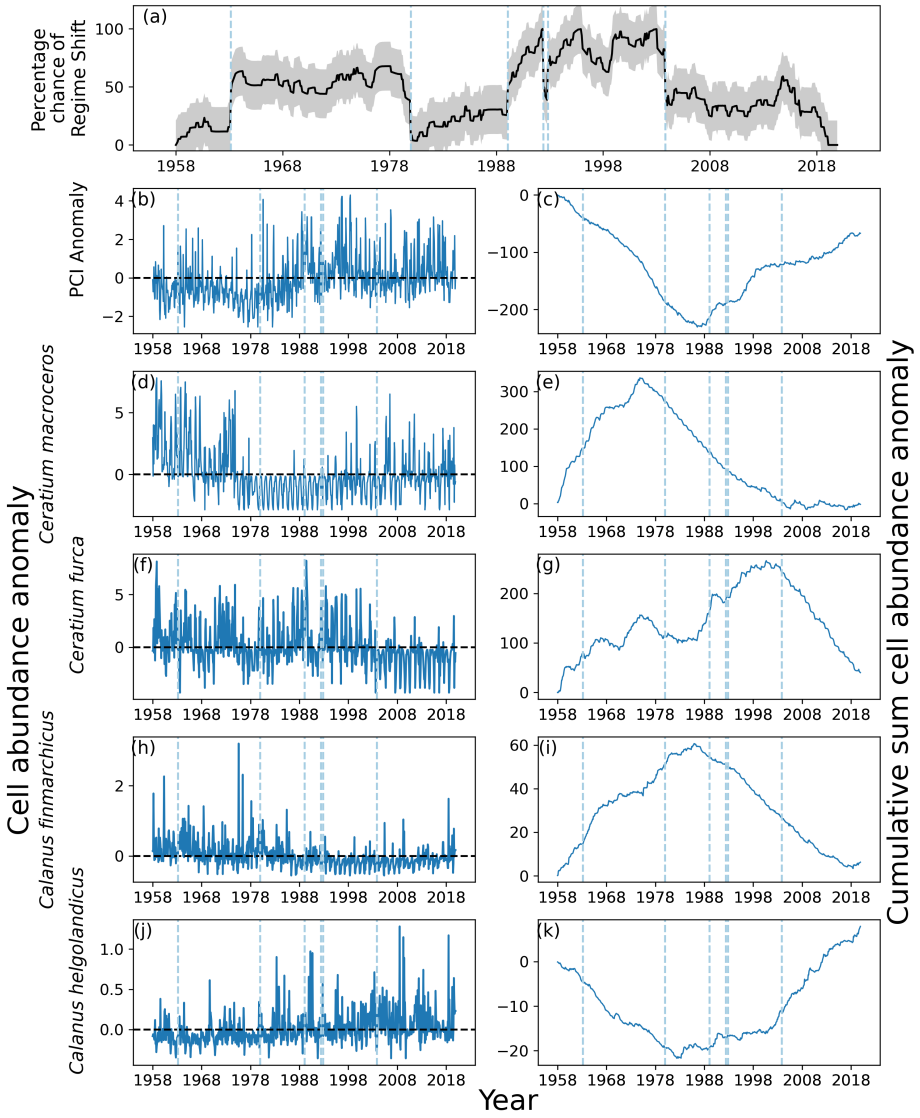

Figure S10: (a) Percentage likelihood of regime shift as estimated by the RST model for Area C2 (see Fig. 1 and 10 from original paper), located between 54° and 58° North and 3° and 12° East; (b) monthly mean anomaly and (c) cumulative sum of PCI; (d) monthly mean anomaly and (e) cumulative sum of phytoplankton species abundance exhibiting greatest range; (f) monthly mean anomaly and (g) cumulative sum of phytoplankton species abundance exhibiting second greatest range; (h) monthly mean anomaly and (i) cumulative sum of *Calanus finmarchicus*; and (j) monthly mean anomaly and (k) cumulative sum of *C. helgolandicus*. A window length of 6 months was used in Eq. 5.

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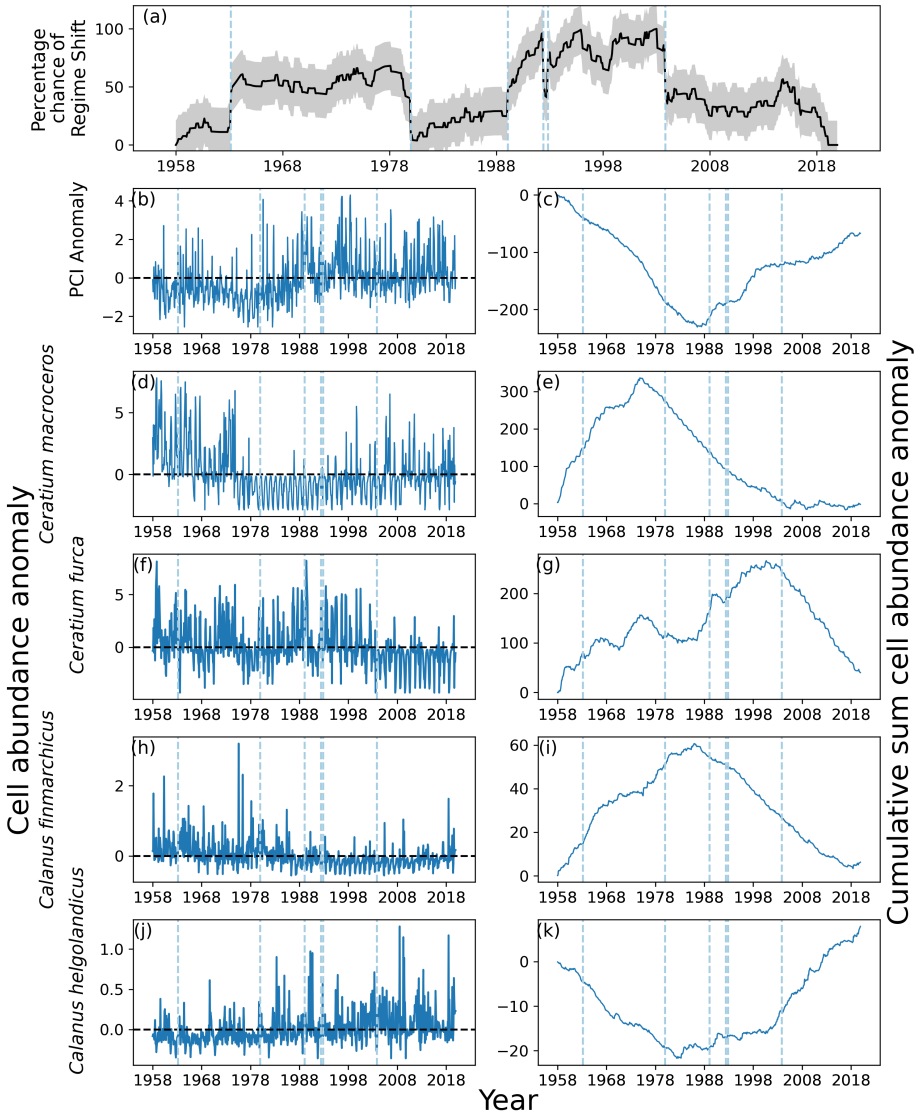

Figure S11: (a) Percentage likelihood of regime shift as estimated by the RST model for Area C2 (see Fig. 1 and 10 from original paper), located between 54° and 58° North and 3° and 12° East; (b) monthly mean anomaly and (c) cumulative sum of PCI; (d) monthly mean anomaly and (e) cumulative sum of phytoplankton species abundance exhibiting greatest range; (f) monthly mean anomaly and (g) cumulative sum of phytoplankton species abundance exhibiting second greatest range; (h) monthly mean anomaly and (i) cumulative sum of *Calanus finmarchicus*; and (j) monthly mean anomaly and (k) cumulative sum of *C. helgolandicus*. A window length of 12 months was used in Eq. 5.

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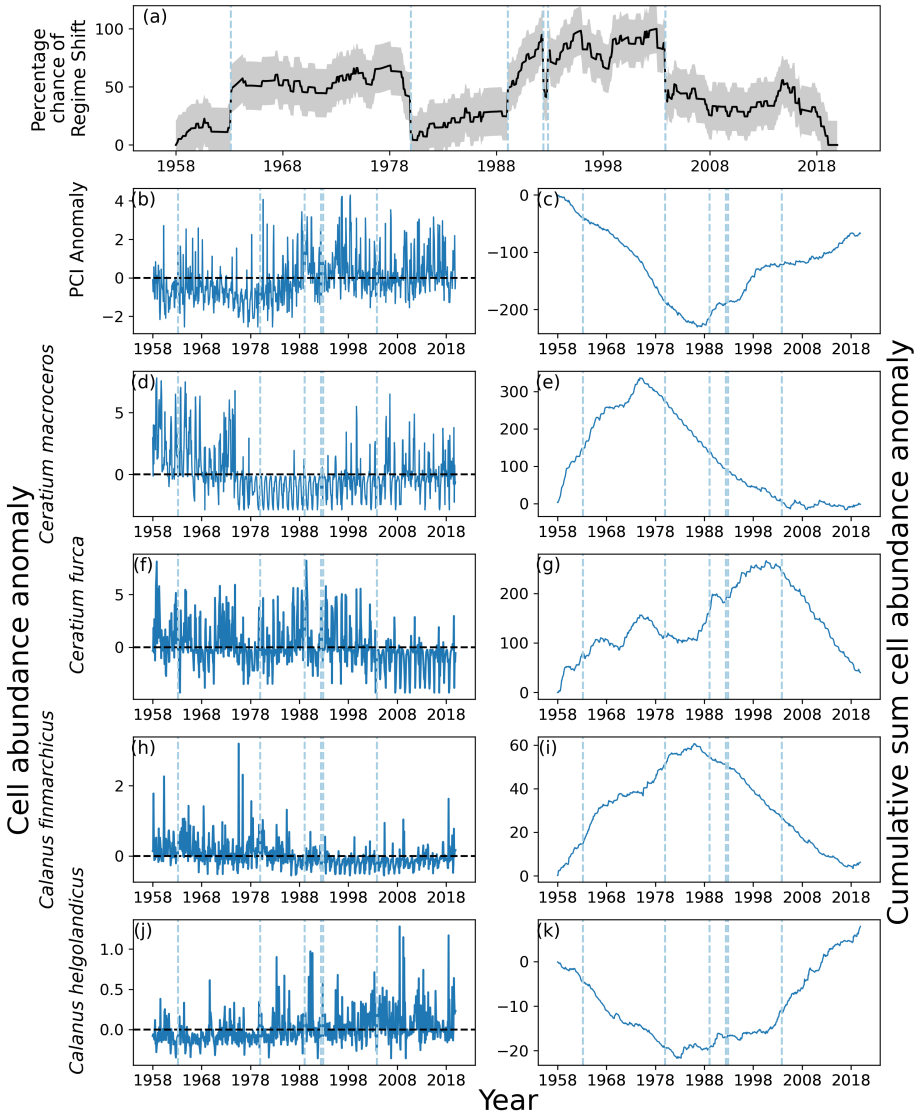

Figure S12: (a) Percentage likelihood of regime shift as estimated by the RST model for Area C2 (see Fig. 1 and 10 from original paper), located between 54° and 58° North and 3° and 12° East; (b) monthly mean anomaly and (c) cumulative sum of PCI; (d) monthly mean anomaly and (e) cumulative sum of phytoplankton species abundance exhibiting greatest range; (f) monthly mean anomaly and (g) cumulative sum of phytoplankton species abundance exhibiting second greatest range; (h) monthly mean anomaly and (i) cumulative sum of *Calanus finmarchicus*; and (j) monthly mean anomaly and (k) cumulative sum of *C. helgolandicus*. A window length of 18 months was used in Eq. 5.

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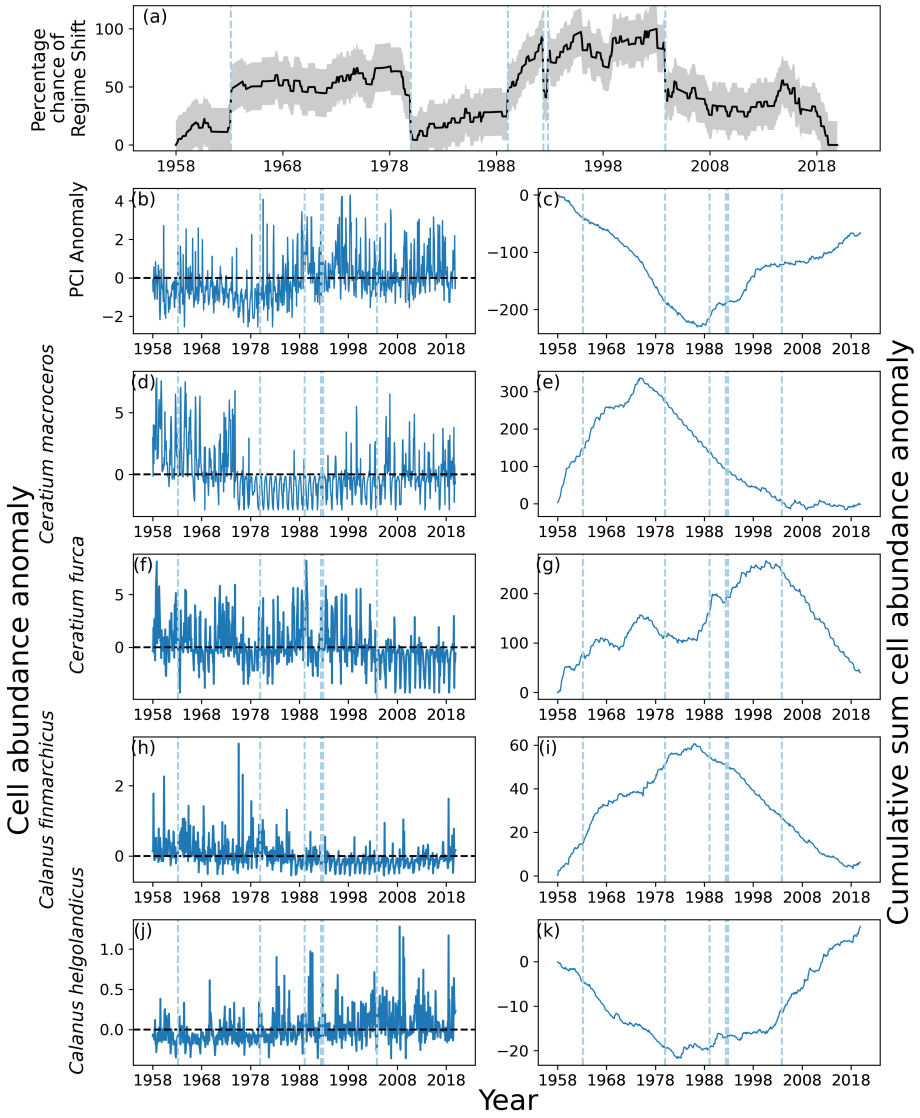

Figure S13: (a) Percentage likelihood of regime shift as estimated by the RST model for Area C2 (see Fig. 1 and 10 from original paper), located between 54° and 58° North and 3° and 12° East; (b) monthly mean anomaly and (c) cumulative sum of PCI; (d) monthly mean anomaly and (e) cumulative sum of phytoplankton species abundance exhibiting greatest range; (f) monthly mean anomaly and (g) cumulative sum of phytoplankton species abundance exhibiting second greatest range; (h) monthly mean anomaly and (i) cumulative sum of *Calanus finmarchicus*; and (j) monthly mean anomaly and (k) cumulative sum of *C. helgolandicus*. A window length of 24 months was used in Eq. 5.

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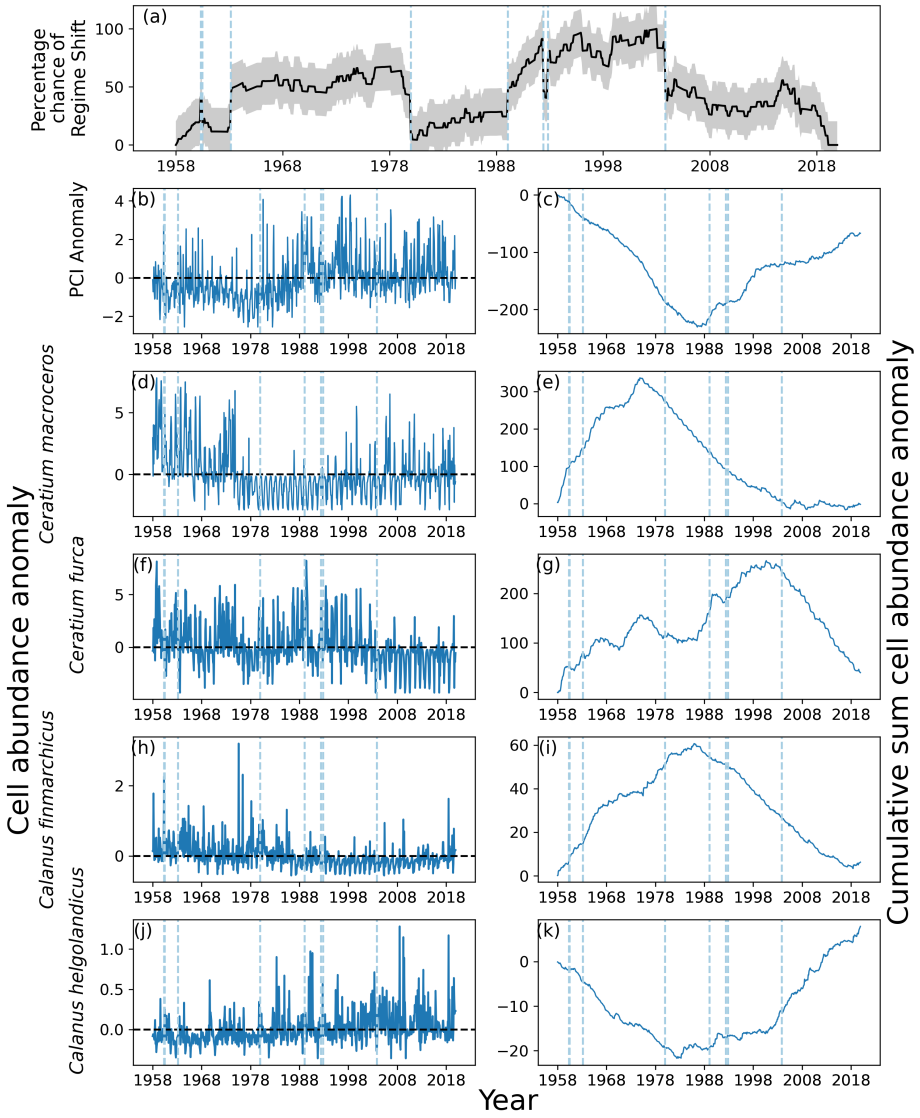

Figure S14: (a) Percentage likelihood of regime shift as estimated by the RST model for Area C2 (see Fig. 1 and 10 from original paper), located between 54° and 58° North and 3° and 12° East; (b) monthly mean anomaly and (c) cumulative sum of PCI; (d) monthly mean anomaly and (e) cumulative sum of phytoplankton species abundance exhibiting greatest range; (f) monthly mean anomaly and (g) cumulative sum of phytoplankton species abundance exhibiting second greatest range; (h) monthly mean anomaly and (i) cumulative sum of *Calanus finmarchicus*; and (j) monthly mean anomaly and (k) cumulative sum of *C. helgolandicus*. A window length of 30 months was used in Eq. 5.

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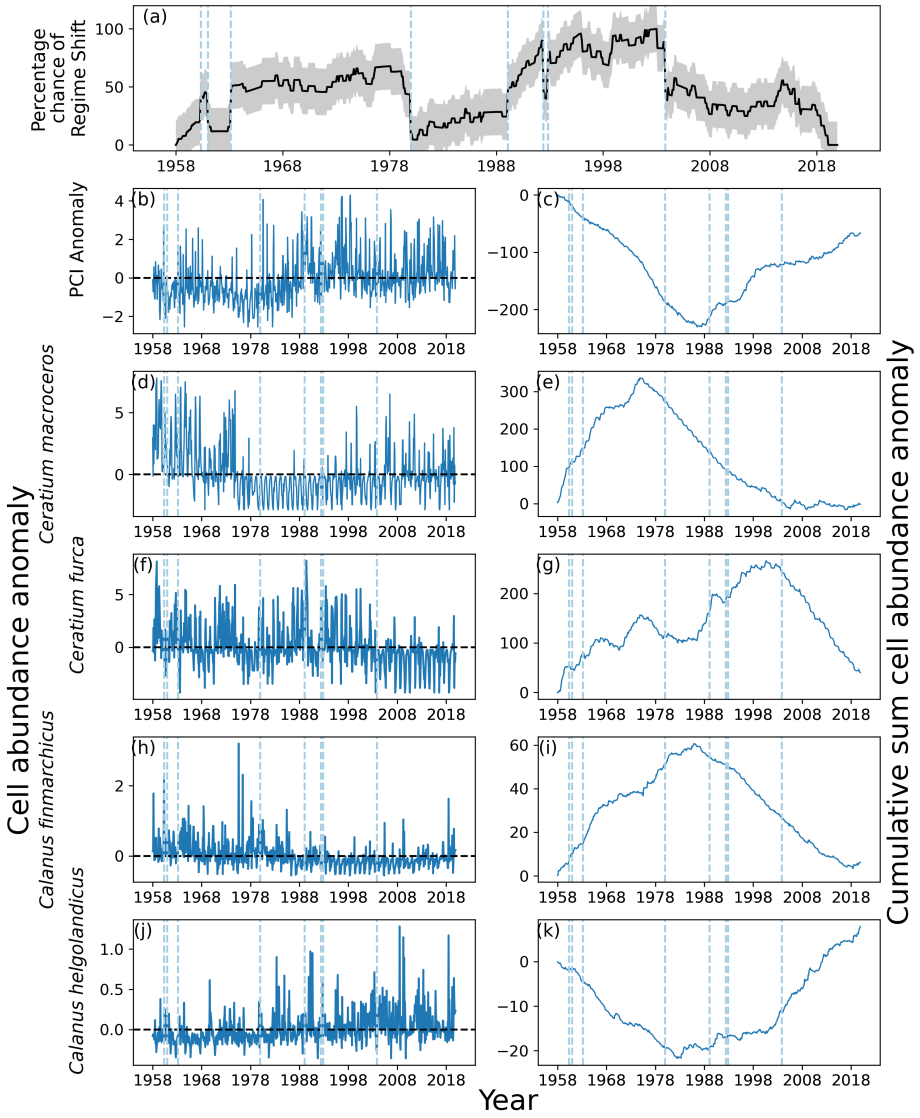

Figure S15: (a) Percentage likelihood of regime shift as estimated by the RST model for Area C2 (see Fig. 1 and 10 from original paper), located between 54° and 58° North and 3° and 12° East; (b) monthly mean anomaly and (c) cumulative sum of PCI; (d) monthly mean anomaly and (e) cumulative sum of phytoplankton species abundance exhibiting greatest range; (f) monthly mean anomaly and (g) cumulative sum of phytoplankton species abundance exhibiting second greatest range; (h) monthly mean anomaly and (i) cumulative sum of *Calanus finmarchicus*; and (j) monthly mean anomaly and (k) cumulative sum of *C. helgolandicus*. A window length of 36 months was used in Eq. 5.

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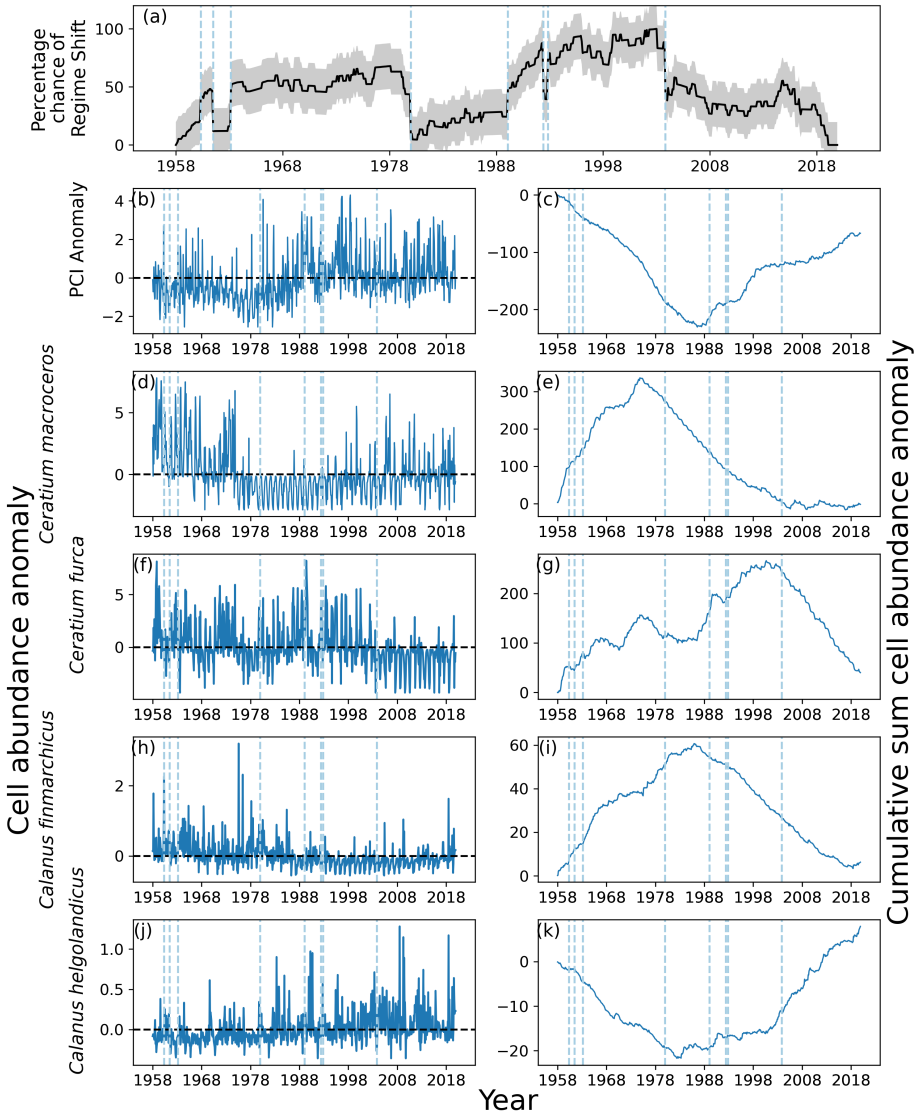

Figure S16: (a) Percentage likelihood of regime shift as estimated by the RST model for Area C2 (see Fig. 1 and 10 from original paper), located between 54° and 58° North and 3° and 12° East; (b) monthly mean anomaly and (c) cumulative sum of PCI; (d) monthly mean anomaly and (e) cumulative sum of phytoplankton species abundance exhibiting greatest range; (f) monthly mean anomaly and (g) cumulative sum of phytoplankton species abundance exhibiting second greatest range; (h) monthly mean anomaly and (i) cumulative sum of *Calanus finmarchicus*; and (j) monthly mean anomaly and (k) cumulative sum of *C. helgolandicus*. A window length of 42 months was used in Eq. 5.

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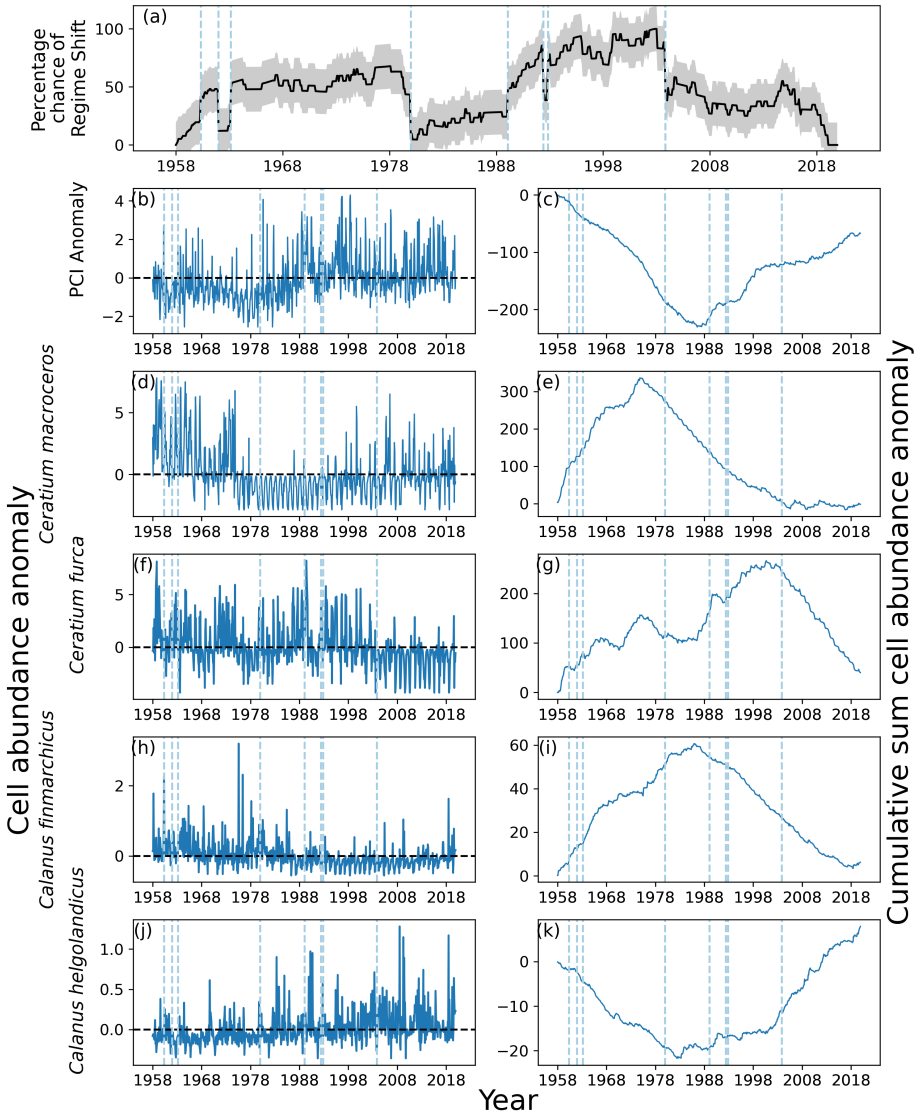

Figure S17: (a) Percentage likelihood of regime shift as estimated by the RST model for Area C2 (see Fig. 1 and 10 from original paper), located between 54° and 58° North and 3° and 12° East; (b) monthly mean anomaly and (c) cumulative sum of PCI; (d) monthly mean anomaly and (e) cumulative sum of phytoplankton species abundance exhibiting greatest range; (f) monthly mean anomaly and (g) cumulative sum of phytoplankton species abundance exhibiting second greatest range; (h) monthly mean anomaly and (i) cumulative sum of *Calanus finmarchicus*; and (j) monthly mean anomaly and (k) cumulative sum of *C. helgolandicus*. A window length of 48 months was used in Eq. 5.

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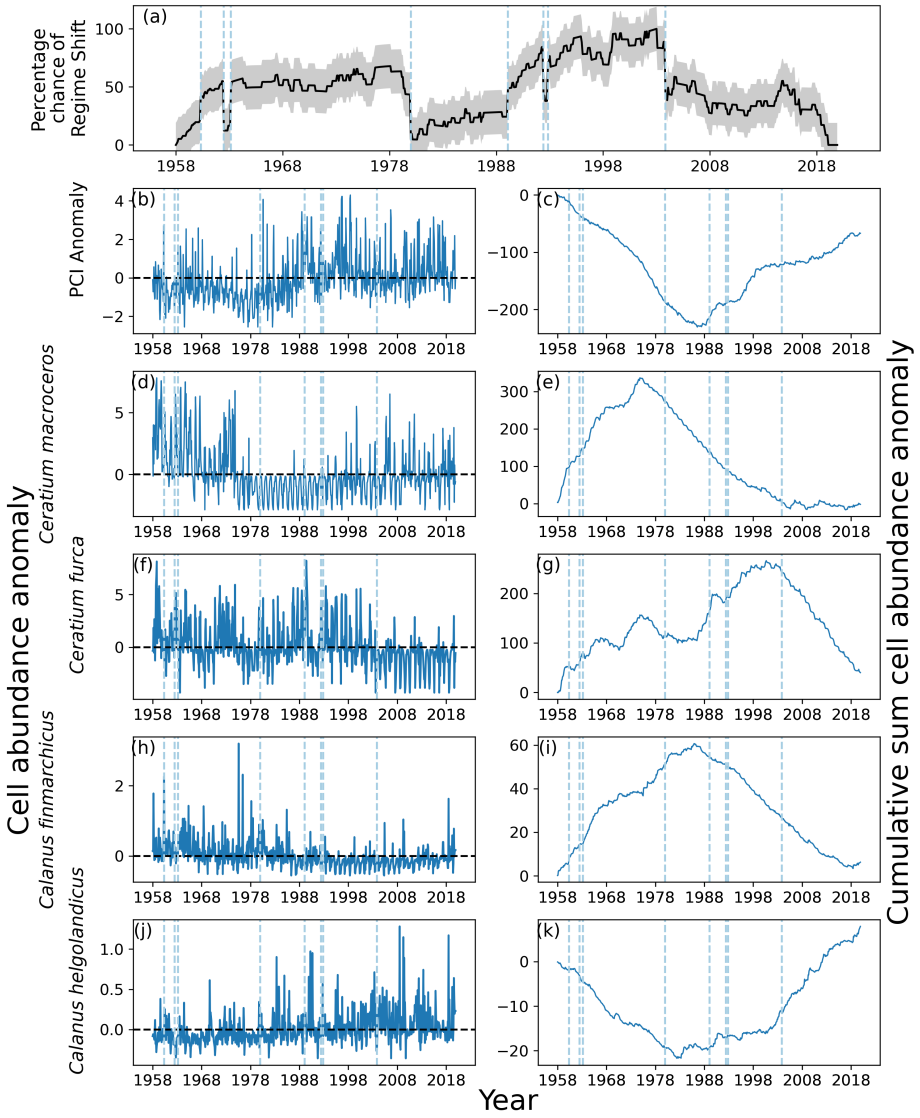

Figure S18: (a) Percentage likelihood of regime shift as estimated by the RST model for Area C2 (see Fig. 1 and 10 from original paper), located between 54° and 58° North and 3° and 12° East; (b) monthly mean anomaly and (c) cumulative sum of PCI; (d) monthly mean anomaly and (e) cumulative sum of phytoplankton species abundance exhibiting greatest range; (f) monthly mean anomaly and (g) cumulative sum of phytoplankton species abundance exhibiting second greatest range; (h) monthly mean anomaly and (i) cumulative sum of *Calanus finmarchicus*; and (j) monthly mean anomaly and (k) cumulative sum of *C. helgolandicus*. A window length of 54 months was used in Eq. 5.

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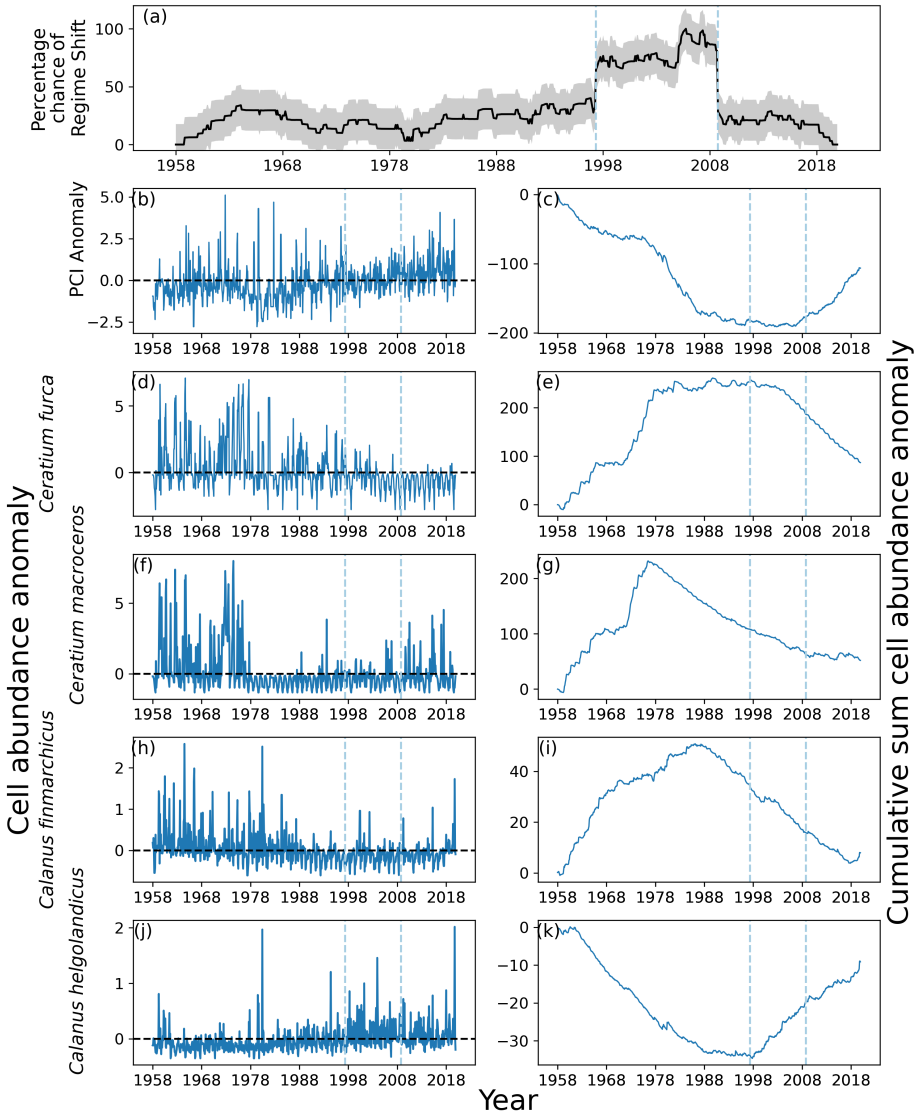

Figure S19: (a) Percentage likelihood of regime shift as estimated by the RST model for Area D1 (see Fig. 1 and 11 from original paper), located between 54° and 58° North and 3° and 12° East; (b) monthly mean anomaly and (c) cumulative sum of PCI; (d) monthly mean anomaly and (e) cumulative sum of phytoplankton species abundance exhibiting greatest range; (f) monthly mean anomaly and (g) cumulative sum of phytoplankton species abundance exhibiting second greatest range; (h) monthly mean anomaly and (i) cumulative sum of *Calanus finmarchicus*; and (j) monthly mean anomaly and (k) cumulative sum of *C. helgolandicus*. A window length of 6 months was used in Eq. 5.

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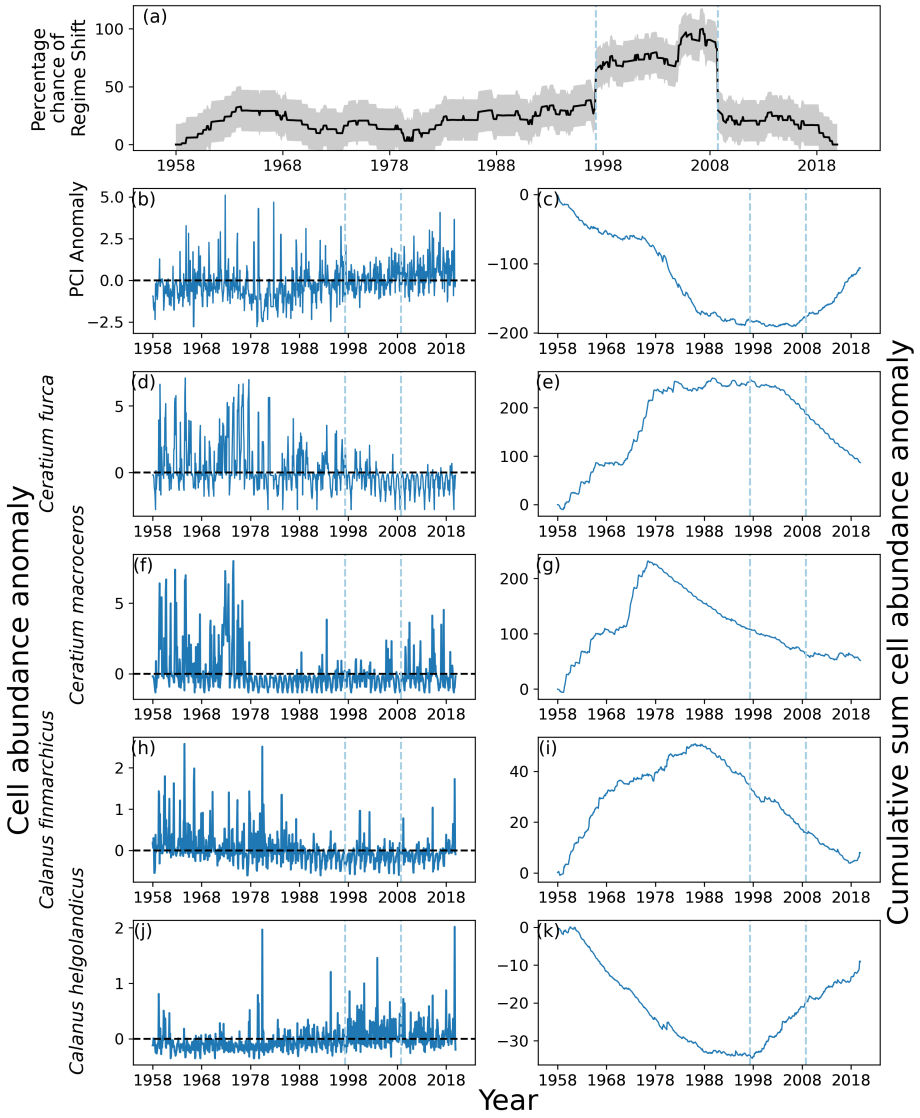

Figure S20: (a) Percentage likelihood of regime shift as estimated by the RST model for Area D1 (see Fig. 1 and 11 from original paper), located between 54° and 58° North and 3° and 12° East; (b) monthly mean anomaly and (c) cumulative sum of PCI; (d) monthly mean anomaly and (e) cumulative sum of phytoplankton species abundance exhibiting greatest range; (f) monthly mean anomaly and (g) cumulative sum of phytoplankton species abundance exhibiting second greatest range; (h) monthly mean anomaly and (i) cumulative sum of *Calanus finmarchicus*; and (j) monthly mean anomaly and (k) cumulative sum of *C. helgolandicus*. A window length of 12 months was used in Eq. 5.

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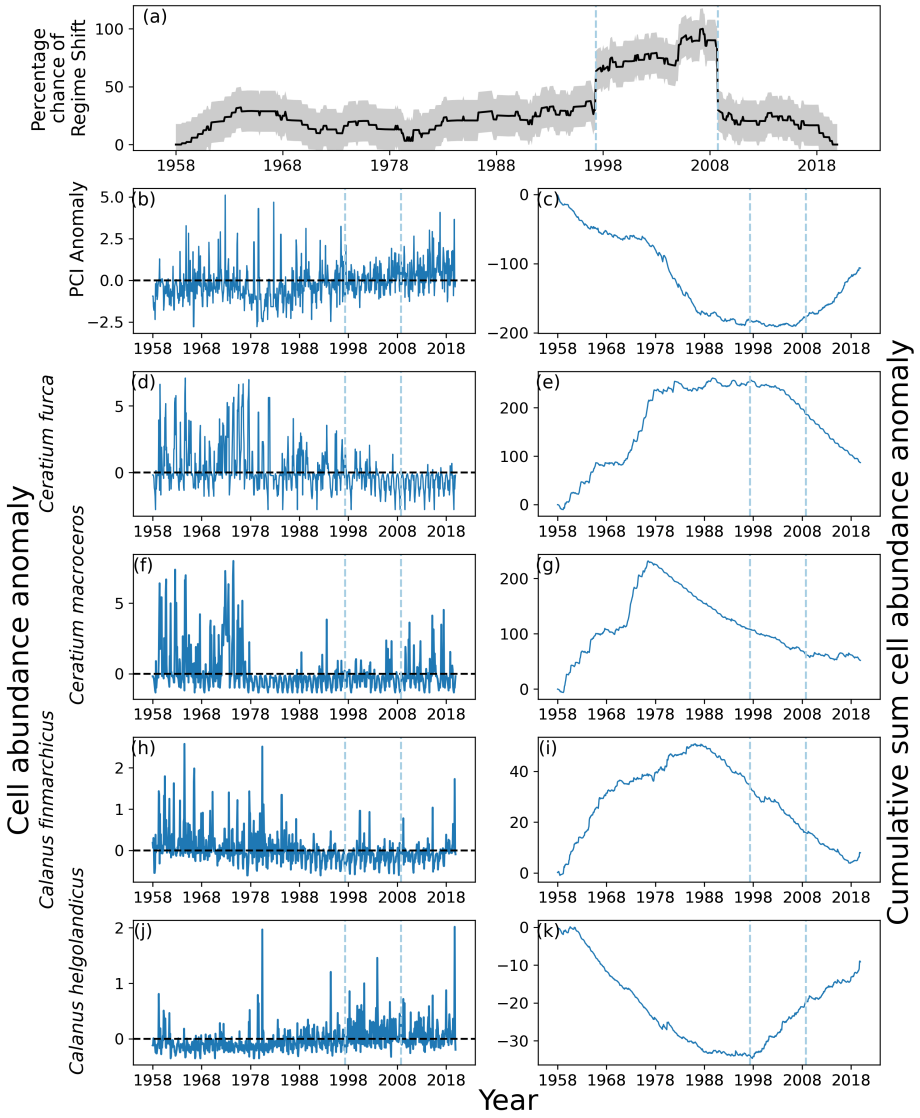

Figure S21: (a) Percentage likelihood of regime shift as estimated by the RST model for Area D1 (see Fig. 1 and 11 from original paper), located between 54° and 58° North and 3° and 12° East; (b) monthly mean anomaly and (c) cumulative sum of PCI; (d) monthly mean anomaly and (e) cumulative sum of phytoplankton species abundance exhibiting greatest range; (f) monthly mean anomaly and (g) cumulative sum of phytoplankton species abundance exhibiting second greatest range; (h) monthly mean anomaly and (i) cumulative sum of *Calanus finmarchicus*; and (j) monthly mean anomaly and (k) cumulative sum of *C. helgolandicus*. A window length of 18 months was used in Eq. 5.

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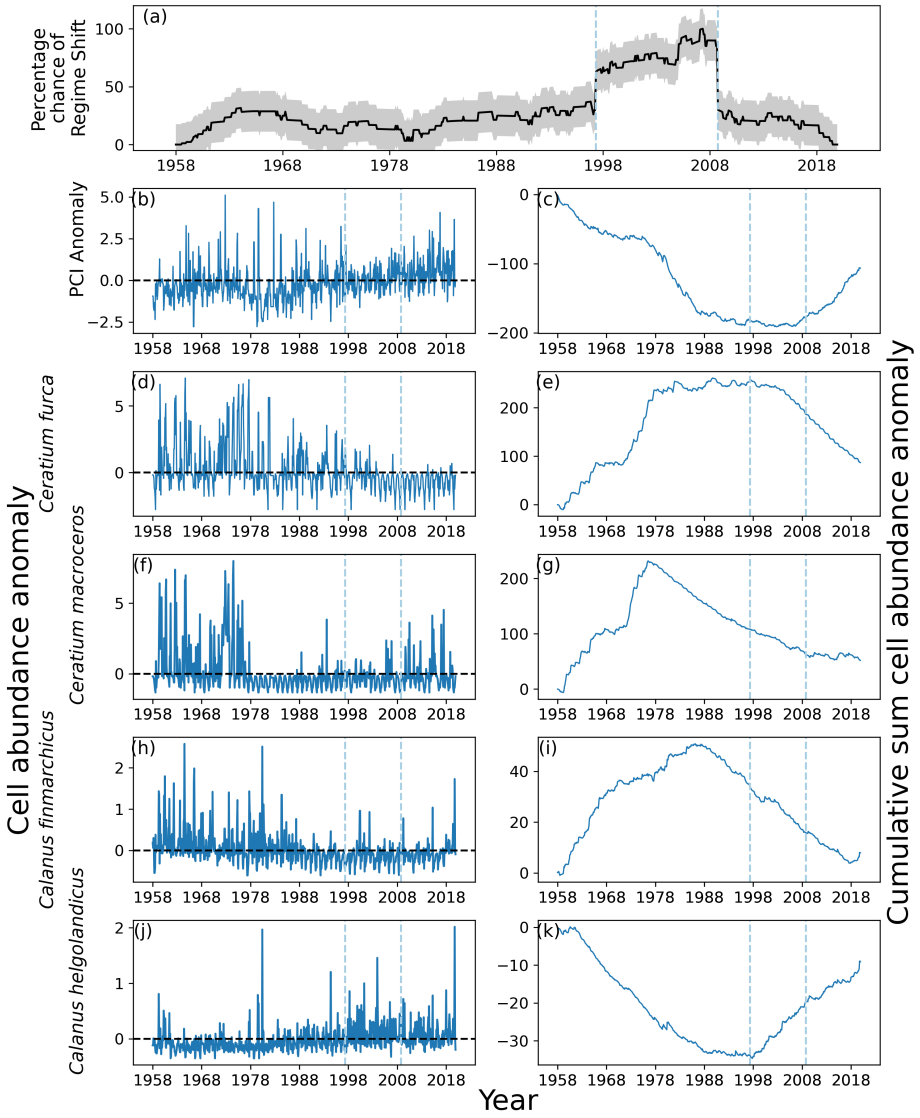

Figure S22: (a) Percentage likelihood of regime shift as estimated by the RST model for Area D1 (see Fig. 1 and 11 from original paper), located between 54° and 58° North and 3° and 12° East; (b) monthly mean anomaly and (c) cumulative sum of PCI; (d) monthly mean anomaly and (e) cumulative sum of phytoplankton species abundance exhibiting greatest range; (f) monthly mean anomaly and (g) cumulative sum of phytoplankton species abundance exhibiting second greatest range; (h) monthly mean anomaly and (i) cumulative sum of *Calanus finmarchicus*; and (j) monthly mean anomaly and (k) cumulative sum of *C. helgolandicus*. A window length of 24 months was used in Eq. 5.

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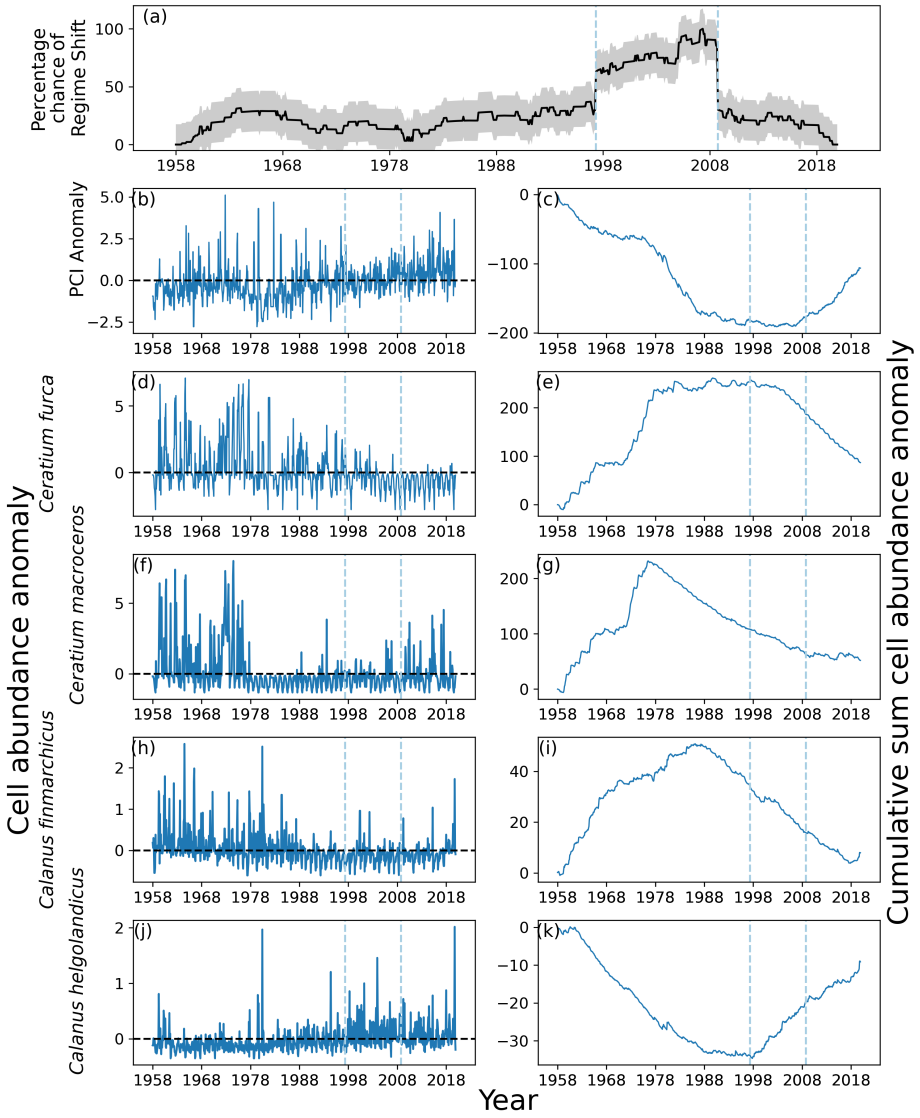

Figure S23: (a) Percentage likelihood of regime shift as estimated by the RST model for Area D1 (see Fig. 1 and 11 from original paper), located between 54° and 58° North and 3° and 12° East; (b) monthly mean anomaly and (c) cumulative sum of PCI; (d) monthly mean anomaly and (e) cumulative sum of phytoplankton species abundance exhibiting greatest range; (f) monthly mean anomaly and (g) cumulative sum of phytoplankton species abundance exhibiting second greatest range; (h) monthly mean anomaly and (i) cumulative sum of *Calanus finmarchicus*; and (j) monthly mean anomaly and (k) cumulative sum of *C. helgolandicus*. A window length of 30 months was used in Eq. 5.

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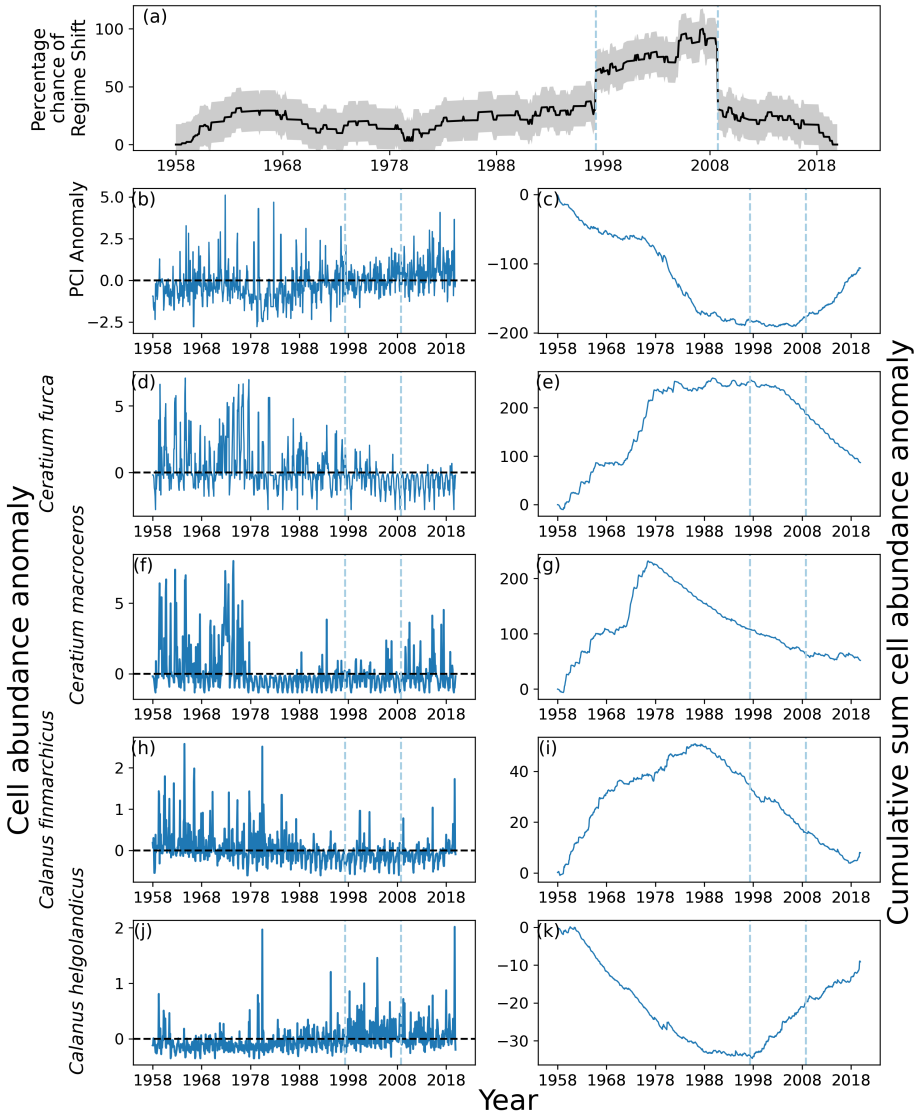

Figure S24: (a) Percentage likelihood of regime shift as estimated by the RST model for Area D1 (see Fig. 1 and 11 from original paper), located between 54° and 58° North and 3° and 12° East; (b) monthly mean anomaly and (c) cumulative sum of PCI; (d) monthly mean anomaly and (e) cumulative sum of phytoplankton species abundance exhibiting greatest range; (f) monthly mean anomaly and (g) cumulative sum of phytoplankton species abundance exhibiting second greatest range; (h) monthly mean anomaly and (i) cumulative sum of *Calanus finmarchicus*; and (j) monthly mean anomaly and (k) cumulative sum of *C. helgolandicus*. A window length of 36 months was used in Eq. 5.

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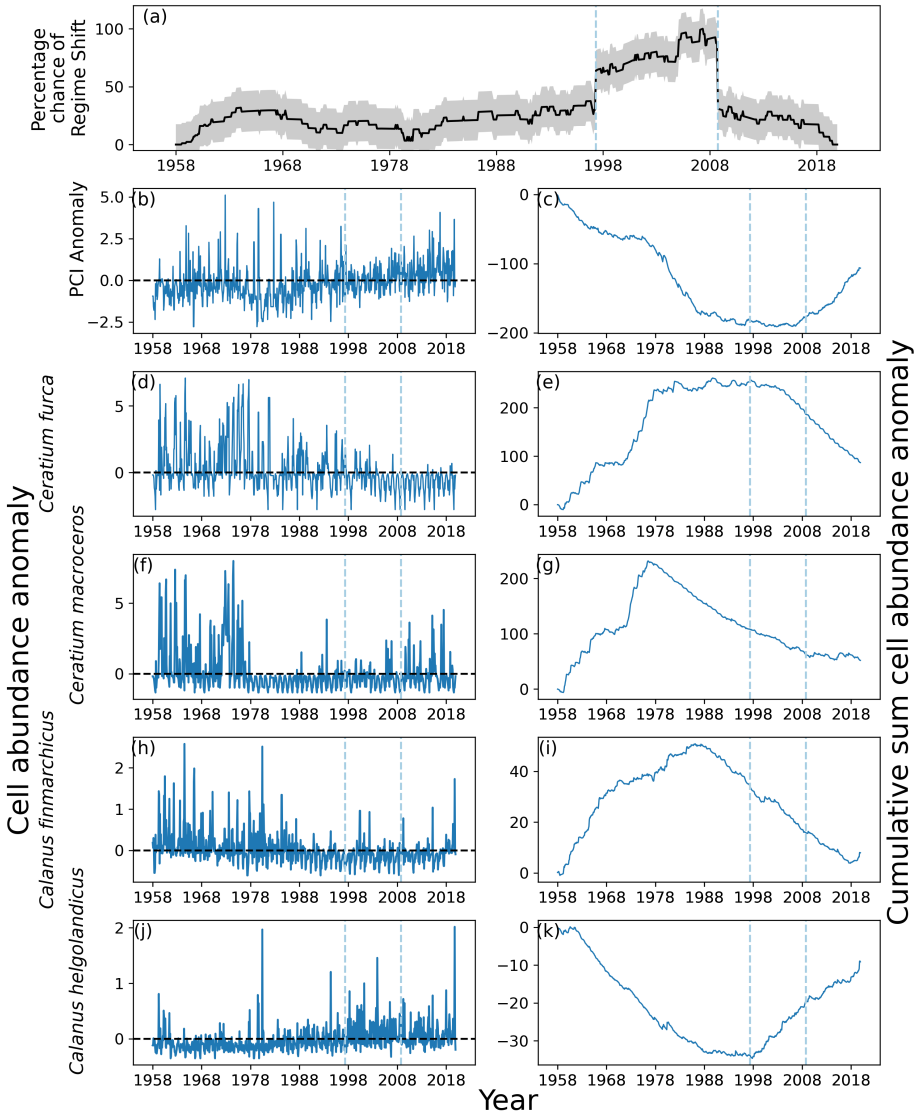

Figure S25: (a) Percentage likelihood of regime shift as estimated by the RST model for Area D1 (see Fig. 1 and 11 from original paper), located between 54° and 58° North and 3° and 12° East; (b) monthly mean anomaly and (c) cumulative sum of PCI; (d) monthly mean anomaly and (e) cumulative sum of phytoplankton species abundance exhibiting greatest range; (f) monthly mean anomaly and (g) cumulative sum of phytoplankton species abundance exhibiting second greatest range; (h) monthly mean anomaly and (i) cumulative sum of *Calanus finmarchicus*; and (j) monthly mean anomaly and (k) cumulative sum of *C. helgolandicus*. A window length of 42 months was used in Eq. 5.

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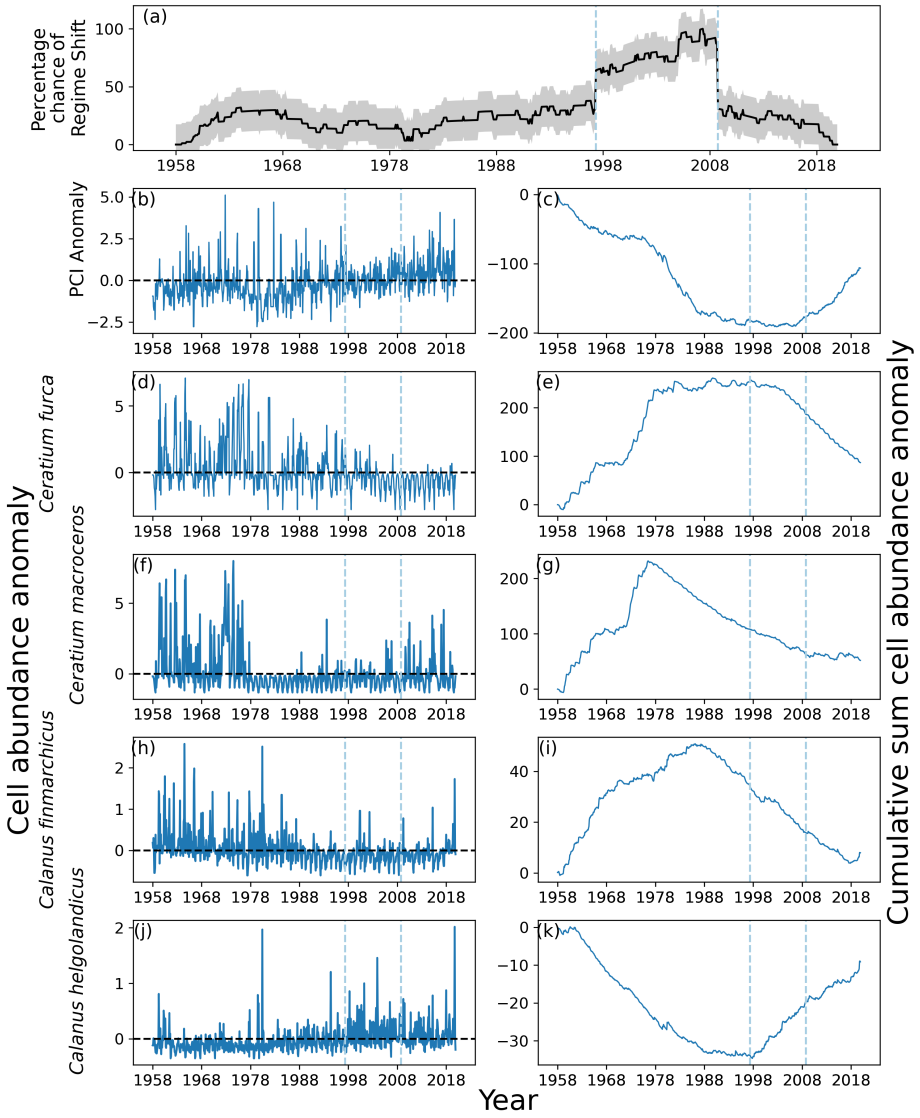

Figure S26: (a) Percentage likelihood of regime shift as estimated by the RST model for Area D1 (see Fig. 1 and 11 from original paper), located between 54° and 58° North and 3° and 12° East; (b) monthly mean anomaly and (c) cumulative sum of PCI; (d) monthly mean anomaly and (e) cumulative sum of phytoplankton species abundance exhibiting greatest range; (f) monthly mean anomaly and (g) cumulative sum of phytoplankton species abundance exhibiting second greatest range; (h) monthly mean anomaly and (i) cumulative sum of *Calanus finmarchicus*; and (j) monthly mean anomaly and (k) cumulative sum of *C. helgolandicus*. A window length of 48 months was used in Eq. 5.

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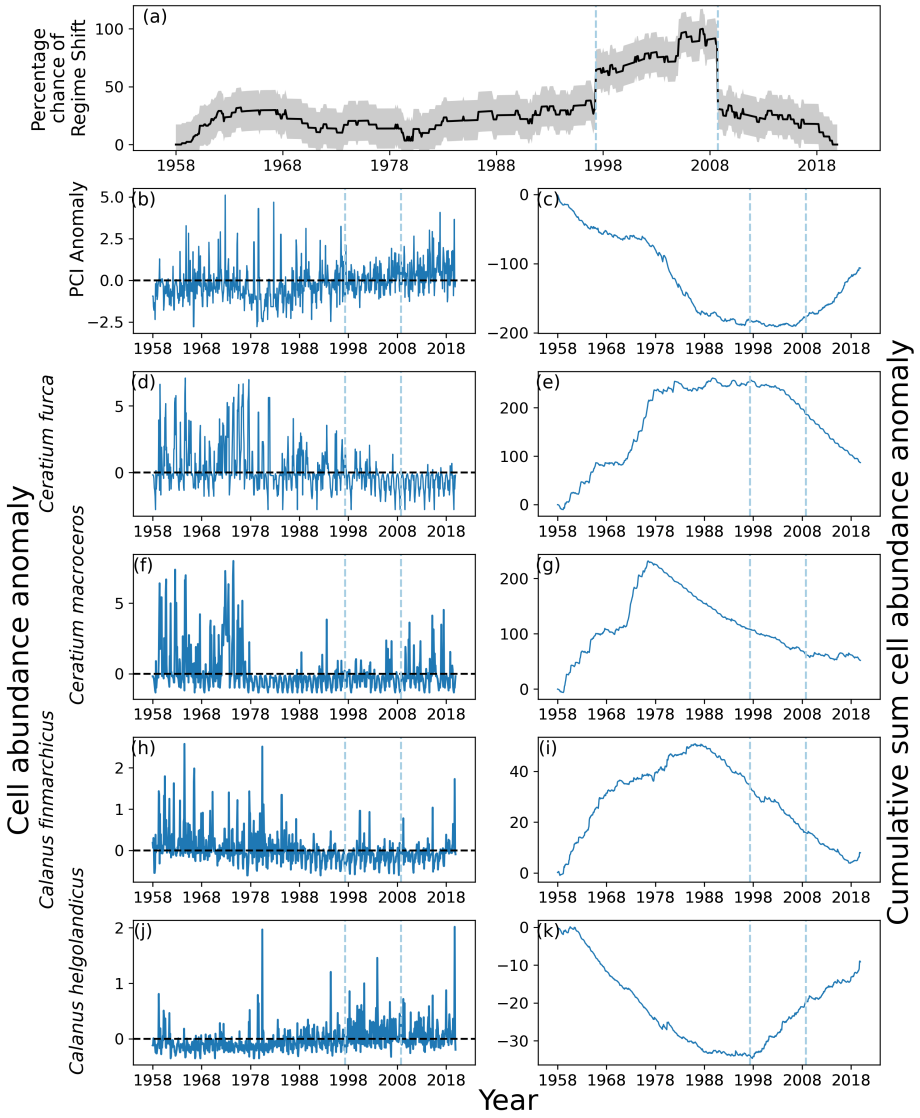

Figure S27: (a) Percentage likelihood of regime shift as estimated by the RST model for Area D1 (see Fig. 1 and 11 from original paper), located between 54° and 58° North and 3° and 12° East; (b) monthly mean anomaly and (c) cumulative sum of PCI; (d) monthly mean anomaly and (e) cumulative sum of phytoplankton species abundance exhibiting greatest range; (f) monthly mean anomaly and (g) cumulative sum of phytoplankton species abundance exhibiting second greatest range; (h) monthly mean anomaly and (i) cumulative sum of *Calanus finmarchicus*; and (j) monthly mean anomaly and (k) cumulative sum of *C. helgolandicus*. A window length of 54 months was used in Eq. 5.

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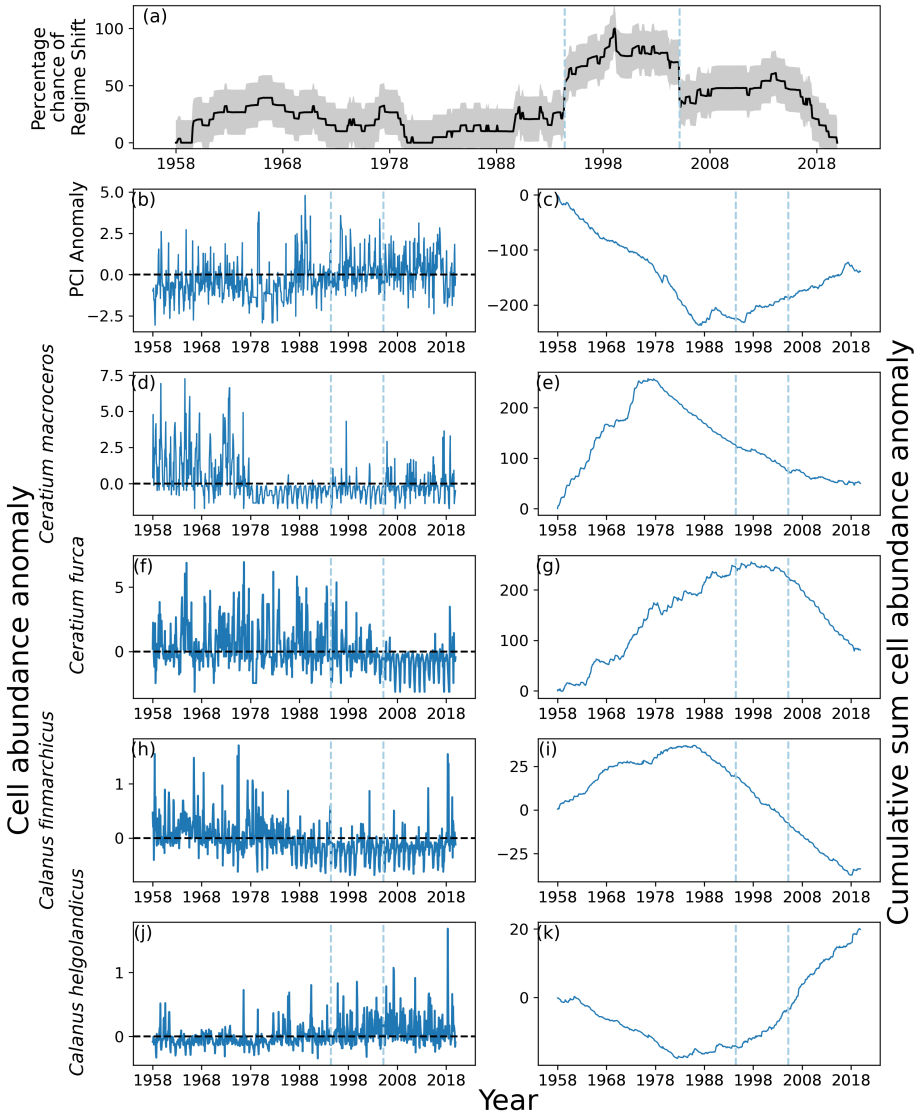

Figure S28: (a) Percentage likelihood of regime shift as estimated by the RST model for Area D2 (see Fig. 1 and 12 from original paper), located between 54° and 58° North and 3° and 12° East; (b) monthly mean anomaly and (c) cumulative sum of PCI; (d) monthly mean anomaly and (e) cumulative sum of phytoplankton species abundance exhibiting greatest range; (f) monthly mean anomaly and (g) cumulative sum of phytoplankton species abundance exhibiting second greatest range; (h) monthly mean anomaly and (i) cumulative sum of *Calanus finmarchicus*; and (j) monthly mean anomaly and (k) cumulative sum of *C. helgolandicus*. A window length of 6 months was used in Eq. 5.

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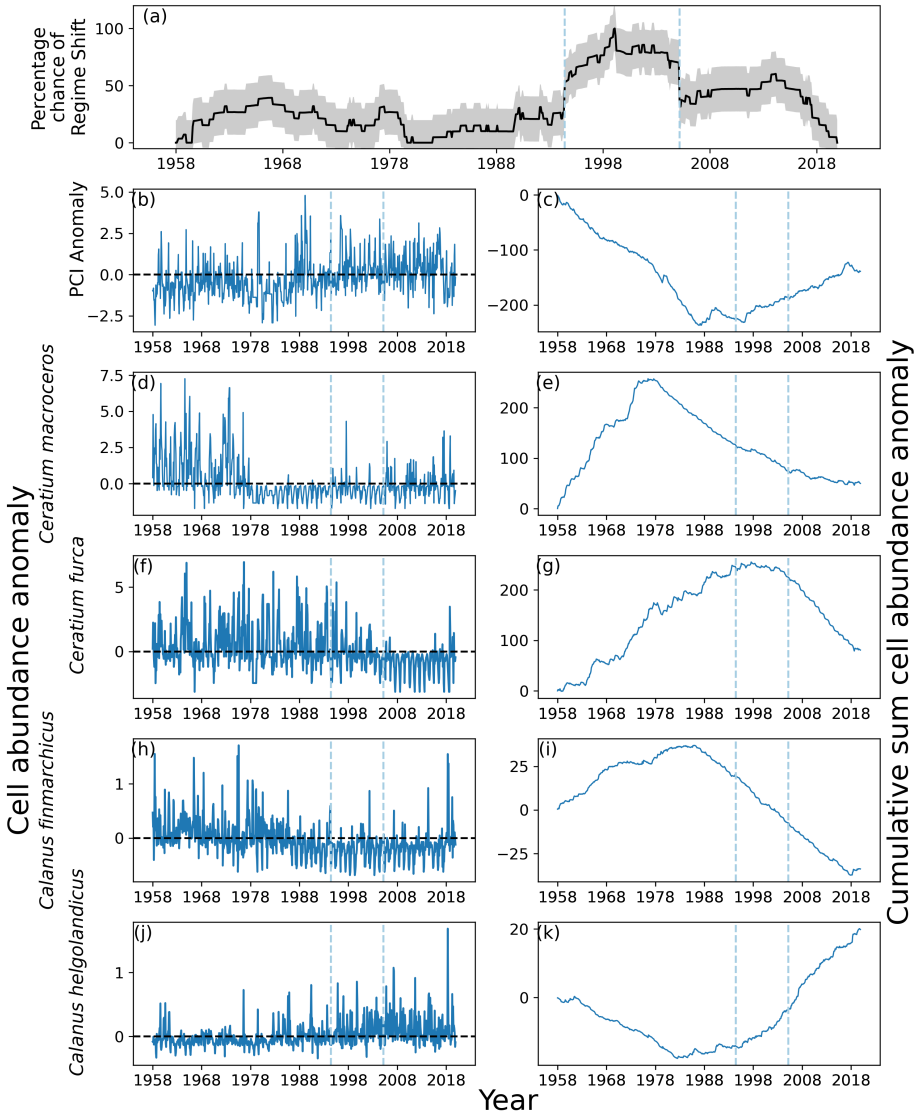

Figure S29: (a) Percentage likelihood of regime shift as estimated by the RST model for Area D2 (see Fig. 1 and 12 from original paper), located between 54° and 58° North and 3° and 12° East; (b) monthly mean anomaly and (c) cumulative sum of PCI; (d) monthly mean anomaly and (e) cumulative sum of phytoplankton species abundance exhibiting greatest range; (f) monthly mean anomaly and (g) cumulative sum of phytoplankton species abundance exhibiting second greatest range; (h) monthly mean anomaly and (i) cumulative sum of *Calanus finmarchicus*; and (j) monthly mean anomaly and (k) cumulative sum of *C. helgolandicus*. A window length of 12 months was used in Eq. 5.

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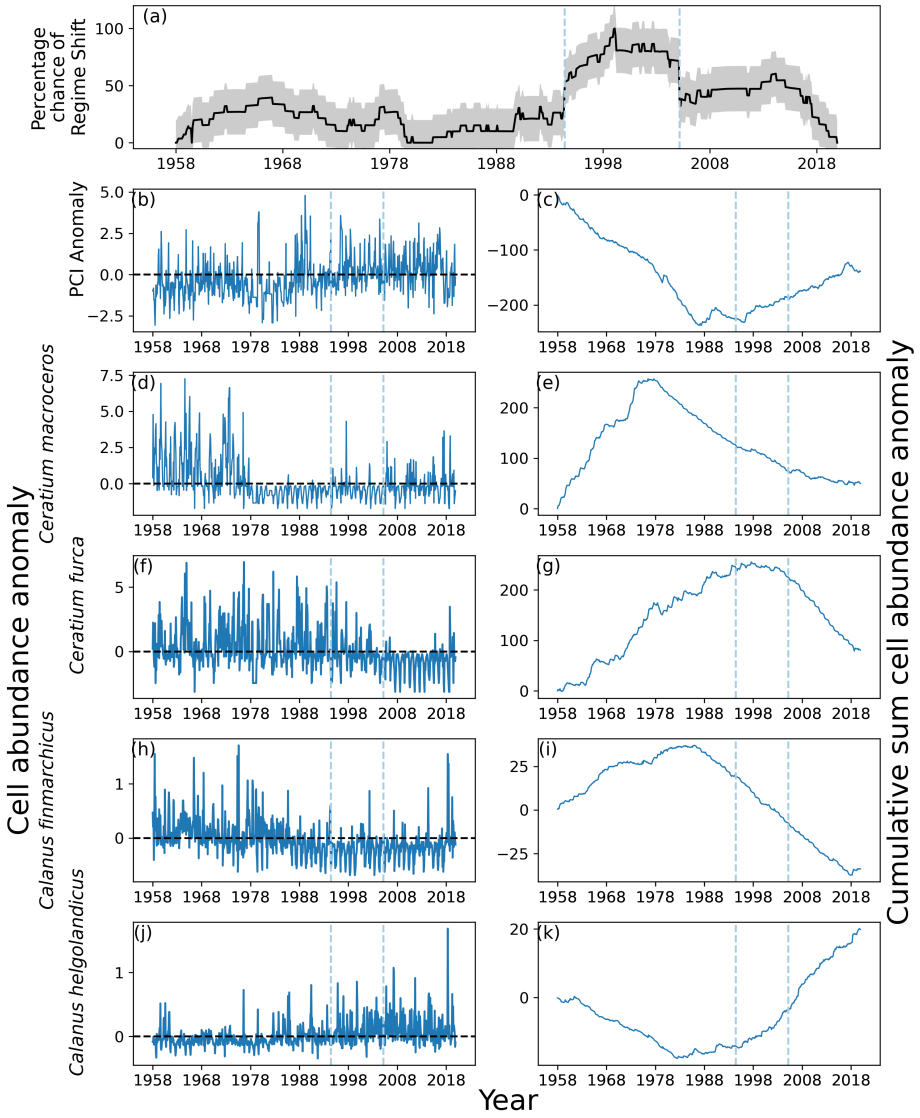

Figure S30: (a) Percentage likelihood of regime shift as estimated by the RST model for Area D2 (see Fig. 1 and 12 from original paper), located between 54° and 58° North and 3° and 12° East; (b) monthly mean anomaly and (c) cumulative sum of PCI; (d) monthly mean anomaly and (e) cumulative sum of phytoplankton species abundance exhibiting greatest range; (f) monthly mean anomaly and (g) cumulative sum of phytoplankton species abundance exhibiting second greatest range; (h) monthly mean anomaly and (i) cumulative sum of *Calanus finmarchicus*; and (j) monthly mean anomaly and (k) cumulative sum of *C. helgolandicus*. A window length of 18 months was used in Eq. 5.

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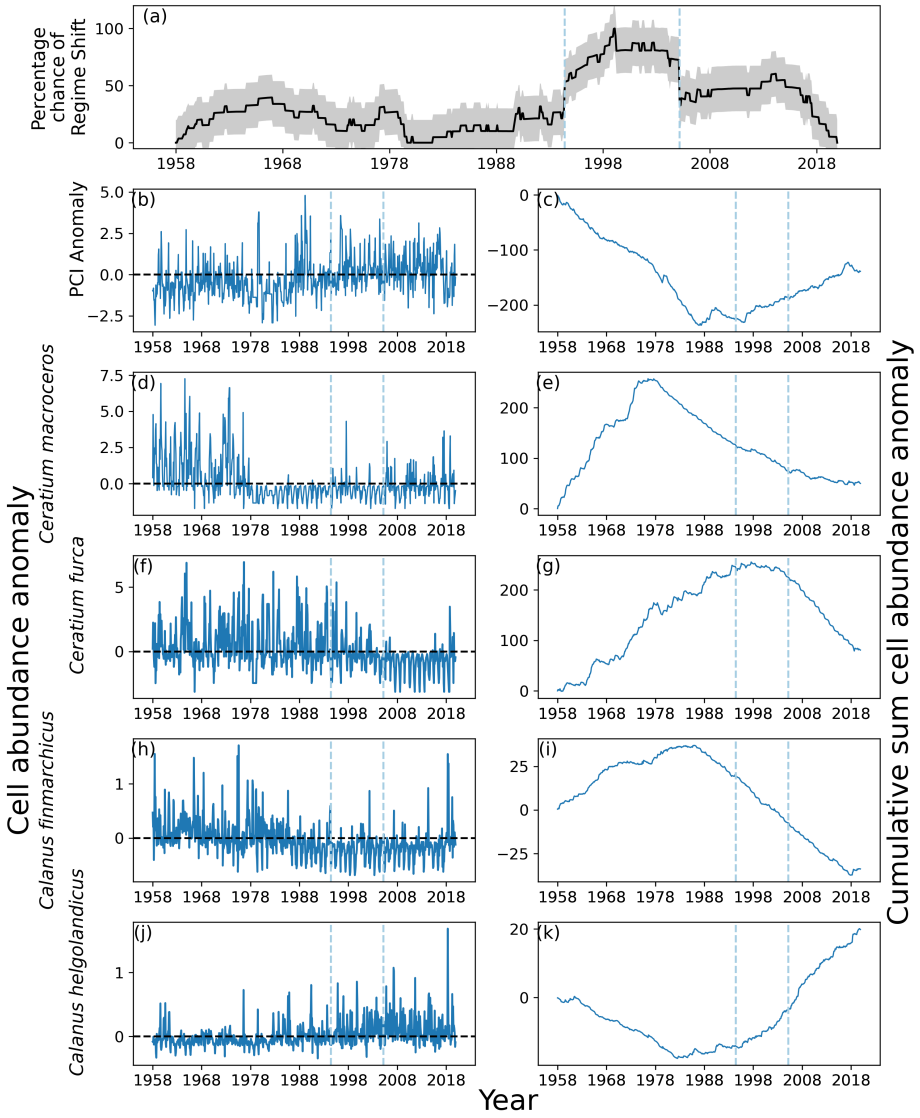

Figure S31: (a) Percentage likelihood of regime shift as estimated by the RST model for Area D2 (see Fig. 1 and 12 from original paper), located between 54° and 58° North and 3° and 12° East; (b) monthly mean anomaly and (c) cumulative sum of PCI; (d) monthly mean anomaly and (e) cumulative sum of phytoplankton species abundance exhibiting greatest range; (f) monthly mean anomaly and (g) cumulative sum of phytoplankton species abundance exhibiting second greatest range; (h) monthly mean anomaly and (i) cumulative sum of *Calanus finmarchicus*; and (j) monthly mean anomaly and (k) cumulative sum of *C. helgolandicus*. A window length of 24 months was used in Eq. 5.

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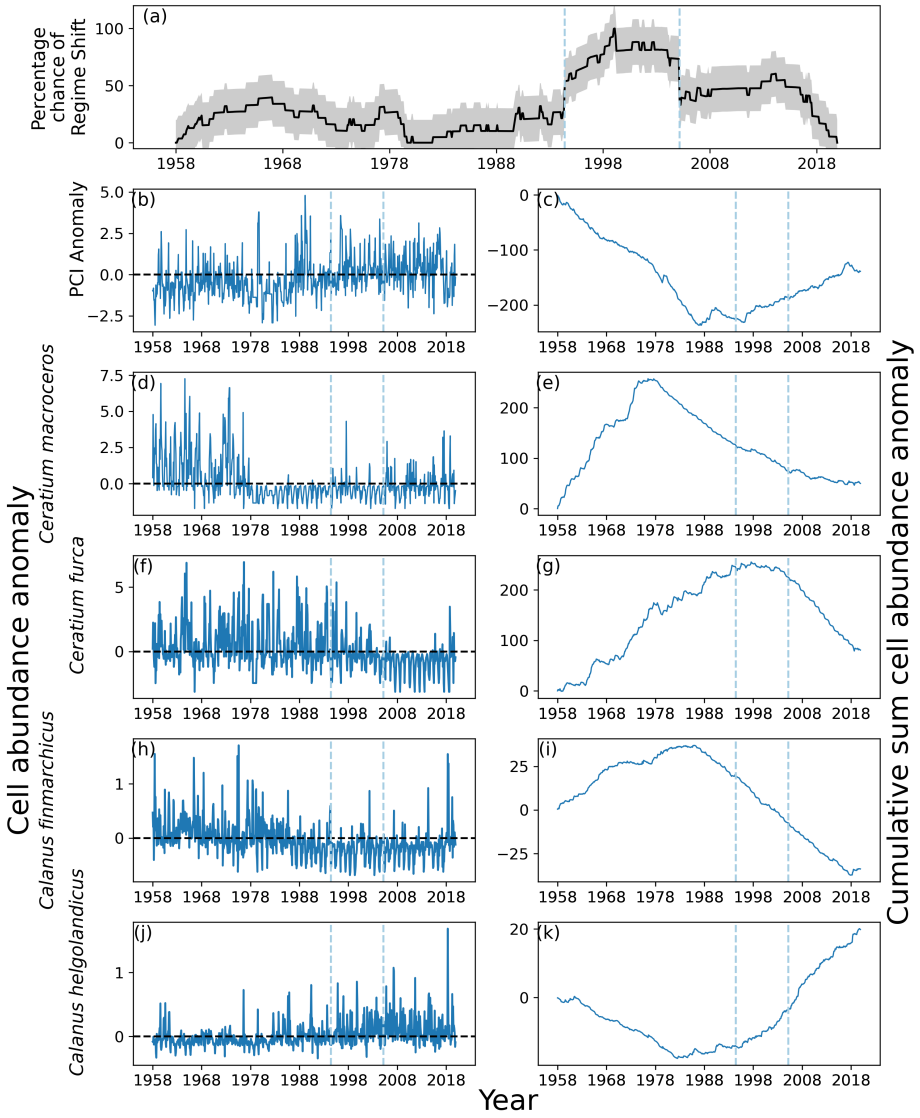

Figure S32: (a) Percentage likelihood of regime shift as estimated by the RST model for Area D2 (see Fig. 1 and 12 from original paper), located between 54° and 58° North and 3° and 12° East; (b) monthly mean anomaly and (c) cumulative sum of PCI; (d) monthly mean anomaly and (e) cumulative sum of phytoplankton species abundance exhibiting greatest range; (f) monthly mean anomaly and (g) cumulative sum of phytoplankton species abundance exhibiting second greatest range; (h) monthly mean anomaly and (i) cumulative sum of *Calanus finmarchicus*; and (j) monthly mean anomaly and (k) cumulative sum of *C. helgolandicus*. A window length of 30 months was used in Eq. 5.

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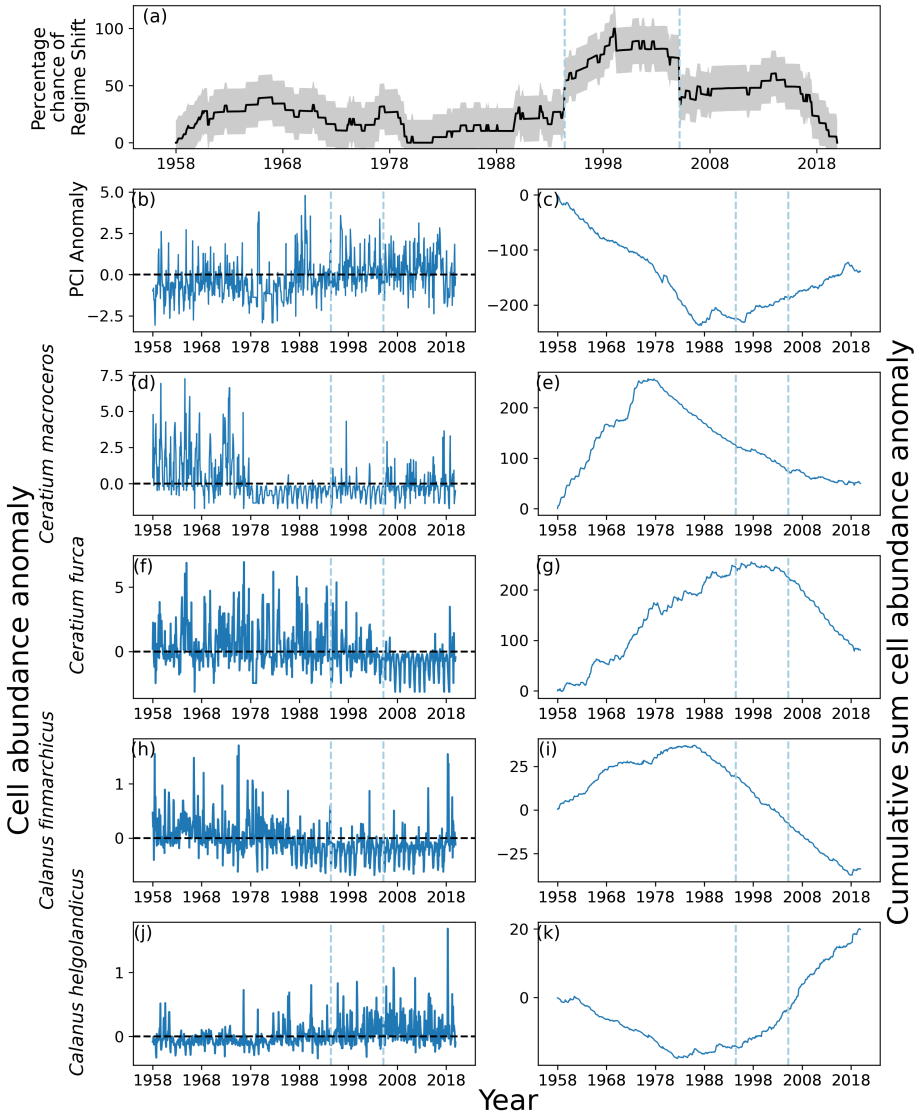

Figure S33: (a) Percentage likelihood of regime shift as estimated by the RST model for Area D2 (see Fig. 1 and 12 from original paper), located between 54° and 58° North and 3° and 12° East; (b) monthly mean anomaly and (c) cumulative sum of PCI; (d) monthly mean anomaly and (e) cumulative sum of phytoplankton species abundance exhibiting greatest range; (f) monthly mean anomaly and (g) cumulative sum of phytoplankton species abundance exhibiting second greatest range; (h) monthly mean anomaly and (i) cumulative sum of *Calanus finmarchicus*; and (j) monthly mean anomaly and (k) cumulative sum of *C. helgolandicus*. A window length of 36 months was used in Eq. 5.

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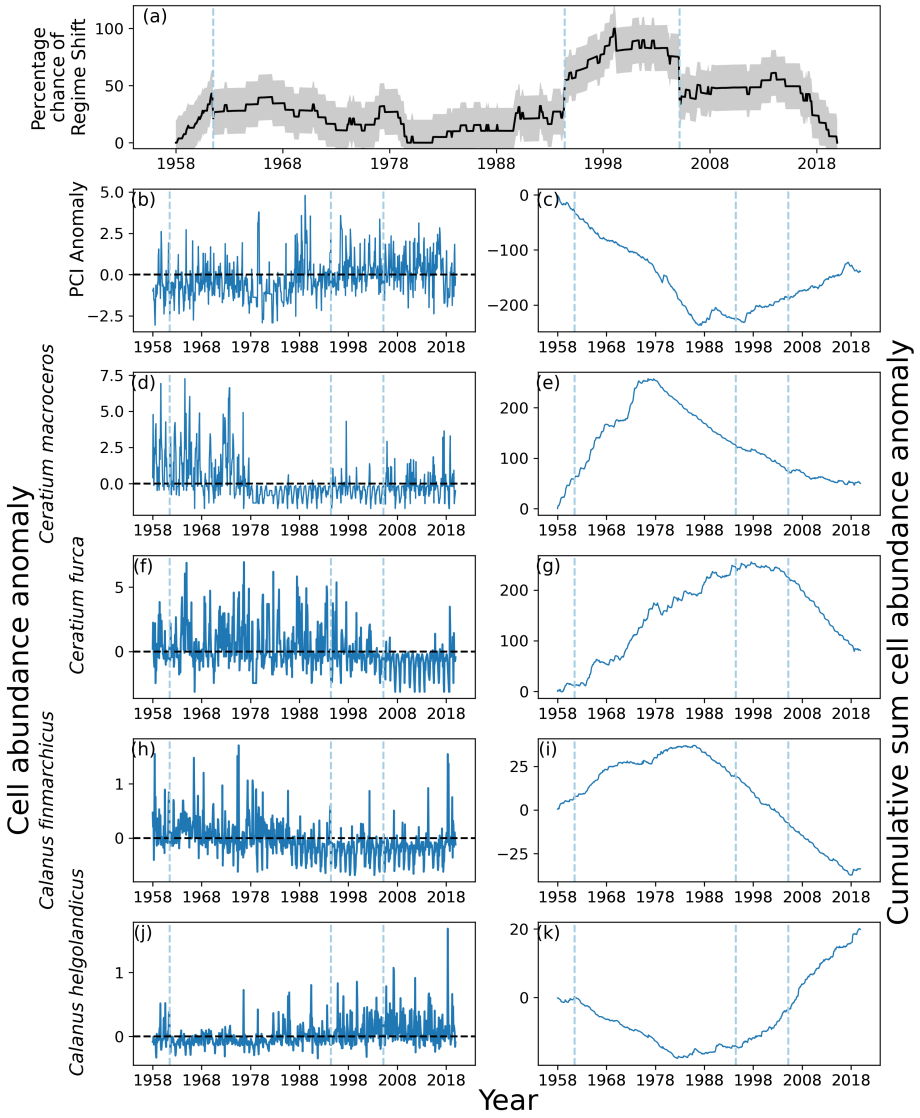

Figure S34: (a) Percentage likelihood of regime shift as estimated by the RST model for Area D2 (see Fig. 1 and 12 from original paper), located between 54° and 58° North and 3° and 12° East; (b) monthly mean anomaly and (c) cumulative sum of PCI; (d) monthly mean anomaly and (e) cumulative sum of phytoplankton species abundance exhibiting greatest range; (f) monthly mean anomaly and (g) cumulative sum of phytoplankton species abundance exhibiting second greatest range; (h) monthly mean anomaly and (i) cumulative sum of *Calanus finmarchicus*; and (j) monthly mean anomaly and (k) cumulative sum of *C. helgolandicus*. A window length of 42 months was used in Eq. 5.

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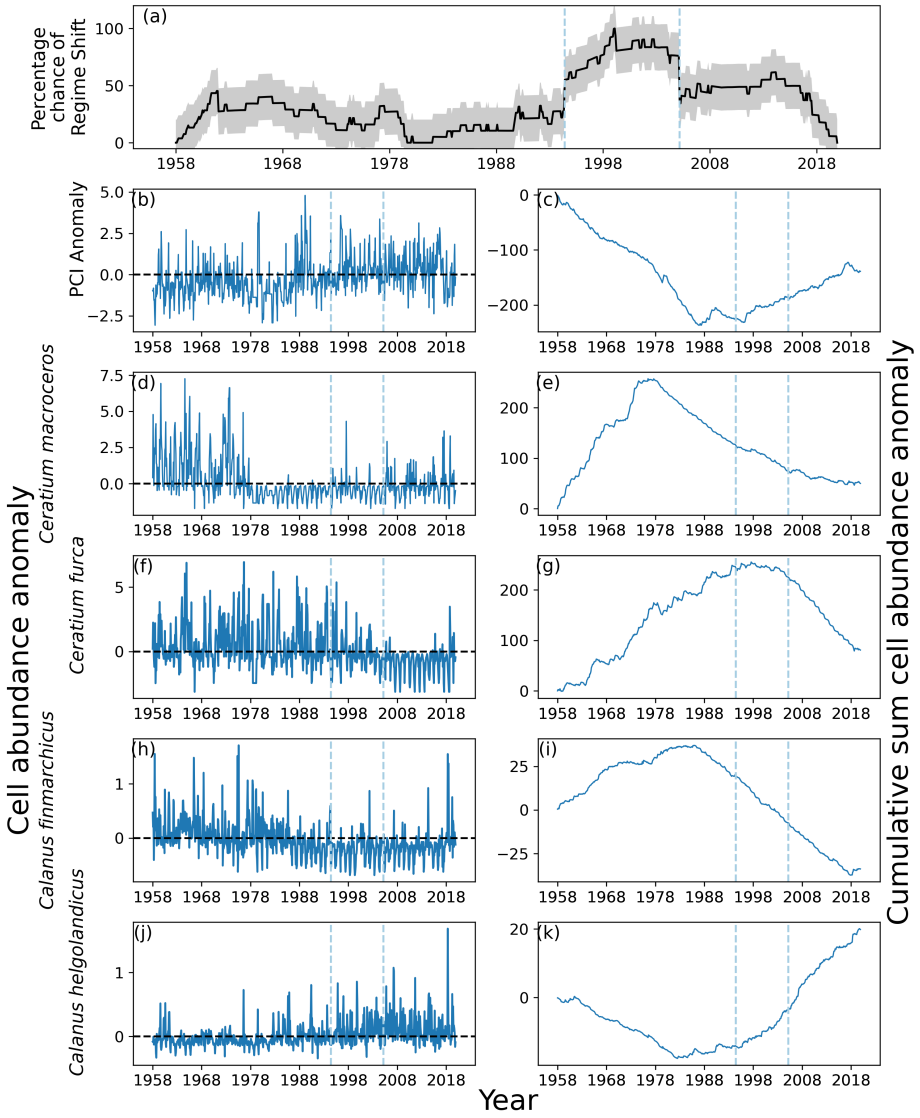

Figure S35: (a) Percentage likelihood of regime shift as estimated by the RST model for Area D2 (see Fig. 1 and 12 from original paper), located between 54° and 58° North and 3° and 12° East; (b) monthly mean anomaly and (c) cumulative sum of PCI; (d) monthly mean anomaly and (e) cumulative sum of phytoplankton species abundance exhibiting greatest range; (f) monthly mean anomaly and (g) cumulative sum of phytoplankton species abundance exhibiting second greatest range; (h) monthly mean anomaly and (i) cumulative sum of *Calanus finmarchicus*; and (j) monthly mean anomaly and (k) cumulative sum of *C. helgolandicus*. A window length of 48 months was used in Eq. 5.

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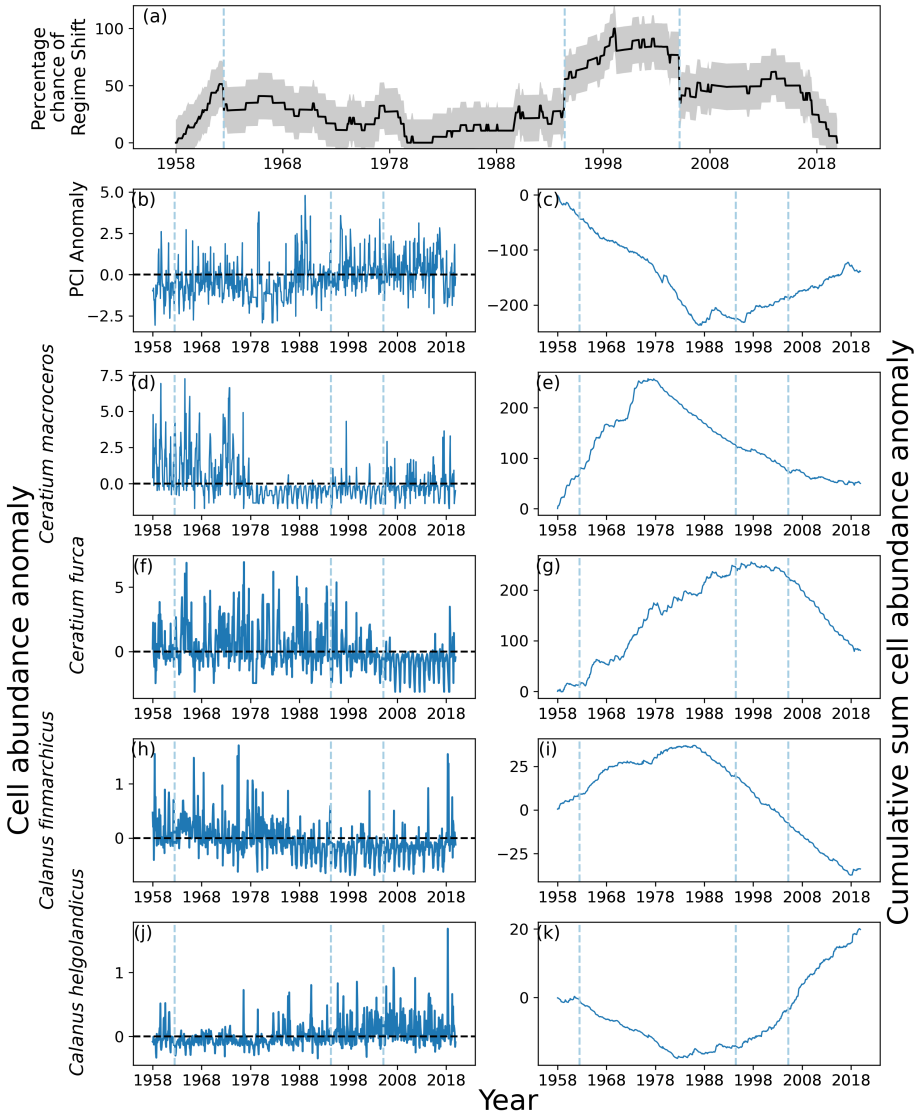

Figure S36: (a) Percentage likelihood of regime shift as estimated by the RST model for Area D2 (see Fig. 1 and 12 from original paper), located between 54° and 58° North and 3° and 12° East; (b) monthly mean anomaly and (c) cumulative sum of PCI; (d) monthly mean anomaly and (e) cumulative sum of phytoplankton species abundance exhibiting greatest range; (f) monthly mean anomaly and (g) cumulative sum of phytoplankton species abundance exhibiting second greatest range; (h) monthly mean anomaly and (i) cumulative sum of *Calanus finmarchicus*; and (j) monthly mean anomaly and (k) cumulative sum of *C. helgolandicus*. A window length of 54 months was used in Eq. 5.

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