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COMMENT

The North Sea plankton regime shift in the late 1990s: Comment on Beaugrand et al. (2014)

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ABSTRACT: Beaugrand et al. (2014; Mar Ecol Prog Ser 502:85–104) reported a regime shift in the North Sea plankton community between 1996 and 2003 as a novel observation. Although they used novel methodology, a shift in the plankton community around 1998 had previously been described by Alvarez-Fernandez et al. (2012; Mar Ecol Prog Ser 462:21–38). Both studies have similar results, but their interpretation differs: Beaugrand et al. (2014) conclude that temperature is the driving force, whereas Alvarez-Fernandez et al. (2012) attribute the regime shift to changes in nutrient dynamics.

KEY WORDS: Seasonal patterns · Regime shift · North Sea · Dinoflagellates · Zooplankton · Nutrients

Beaugrand et al. (2014) analysed with an improved statistical technique (Multiscale split moving window boundary analyses) the abundance of 5 plankton groups in the North Sea: diatoms, dinoflagellates, copepods, other holozooplankton, and meroplankton. Their new technique is an improvement over previous methods. They detected 3 ecosystem shifts, in the 1960s, 1980s and in 1996–2003, and claimed that the latest shift was revealed for the first time.

However, Alvarez-Fernandez et al. (2012) — using the same data sources, taking into consideration the seasonal patterns of the data, and using 3 different detection methods — had already found that the total number of copepods in the North Sea decreased considerably after 1998. Characteristic shelf-sea species such as *Temora longicornis*, *Pseudocalanus* spp., and *Paracalanus* spp., contributed less to the total copepod abundance during autumn and winter in the 2000s, when the abundance of warm-water copepods started to increase (Fig. 1). Alvarez-Fernandez et al. (2012) related the drop in numbers of shelf-sea species to a decrease in dinoflagellate abundance (Fig. 1), a major food source for some copepod species that require a high and constant food supply (Vidal 1980, Evans 1981, Tsuda 1994, Gentsch et al. 2009).

Although I agree with the results of Beaugrand et al. (2014), which confirm Alvarez-Fernandez et al. (2012), I do not fully agree with the conclusion that rising temperature is the driving force behind the changes. Temperature change has an impact on the plankton community, as Alvarez-Fernandez et al. (2012) showed, but the 1998 shift in the North Sea ecosystem was probably related to nutrient dynamics, similar to changes reported for nutrient dynamics and the plankton community in Atlantic waters (Hátún et al. 2009, Johnson et al. 2013).

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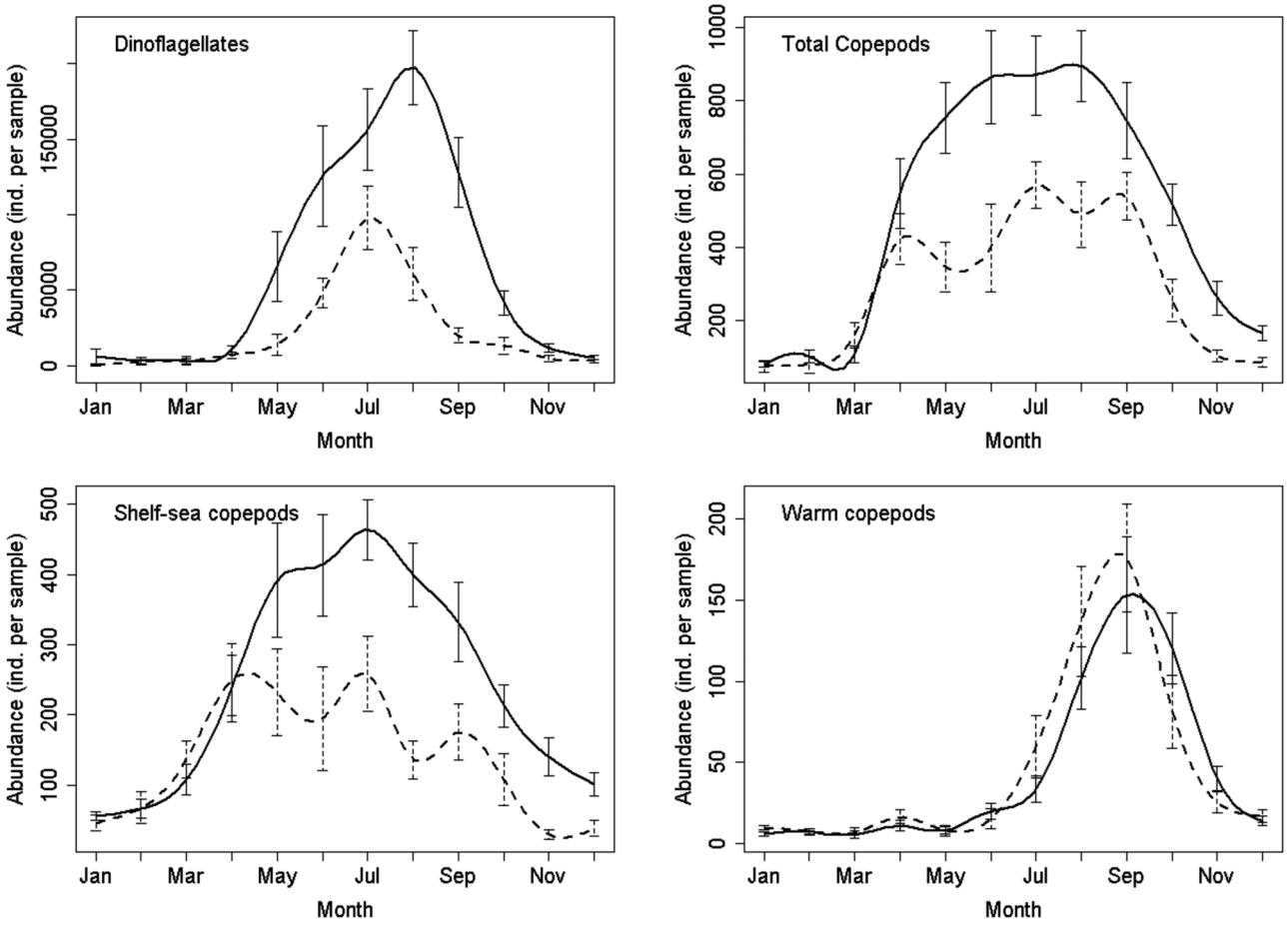

Fig. 1. Seasonal patterns of abundance in North Sea plankton (ind. per sample, mean ± SE). Each line represents the seasonal trend for a specific period of time: Solid line: 1988–1998, dashed line: 1999–2007. Modified from Alvarez-Fernandez et al. (2012)

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Editor's note: Beaugrand and co-authors have been invited to prepare a Reply Comment for publication in a subsequent volume.