

Cette tendance vers des floraisons phytoplanctoniques de plus en plus intense, débutant de plus en plus tôt a aussi été détectée au cours de la dernière décennie sur le plateau néo-écossais (voir l'article de Doug Sameoto dans ce bulletin), suggérant que les causes de ces variations sont attribuables à des facteurs qui agissent à grande échelle. Une tendance vers la hausse des températures de l'air, laquelle fut particulièrement évidente au cours des trois dernières années pour l'est canadien (voir article de Ken Drinkwater dans ce bulletin) pourrait en grande partie être responsable de ces changements récents. Ce réchauffement

des conditions climatiques a certainement modifié le cycle hydrologique du bassin du Saint-Laurent et a sûrement eu une influence significative sur la productivité primaire dans l'écosystème marin le long des côtes canadiennes. Seul le monitoring à long terme peut permettre de déterminer si les variations observées au cours de la dernière décennie sont reliées à des changements climatiques liés à l'effet de serre ou font tout simplement partie d'un cycle naturel de variation de l'écosystème. À cet effet, il faut noter que les biomasses phytoplanctoniques de 2000 sont similaires à celles du début des années 1990, suggérant un retour possible du pendule.

CONTINUOUS PLANKTON RECORDER DOCUMENTS SIGNIFICANT CHANGES IN THE PHYTOPLANKTON AND ZOOPLANKTON IN THE NORTHWEST ATLANTIC DURING THE 1990s

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L'échantillonnage CPR montre des changements majeurs dans l'abondance du zooplancton et du phytoplancton durant les années 1990 comparé à la décennie de 1960 à 1970. L'index de verdure du phytoplancton est significativement plus fort durant les années 1990 qu'à n'importe lequel autre période dans la série de données recueillie sur le plateau Néo-Écossais et dans la région ouest de l'Atlantique. Ces fortes valeurs de l'indice de verdure sur le plateau Néo-Écossais sont dues à une augmentation de l'abondance des diatomées et des dinoflagellés. La longueur de la saison de croissance du phytoplancton s'est aussi allongée durant les années 1990 : elle débutait plus tôt dans l'année et était plus longue d'au moins un mois. Par ailleurs, l'abondance du copépode *Calanus finmarchicus* et celle des euphausiides totaux sont nettement plus basses que leurs moyennes climatologiques durant les années 1995 à 1999 sur le plateau Néo-Écossais et dans la région ouest de l'Atlantique. L'abondance totale des copépodes dans ces deux régions durant les années 1990 ne montrait cependant pas de patron significatif de variation.

Phytoplankton and zooplankton constitute the base of the marine food chain. Their production sets an upper limit on the production of fish and marine mammals and their seasonal and regional distribution may have an important impact on harvestable fisheries. Phytoplankton are microscopic marine plants that form the principal diet of zoo-

plankton and a variety of marine invertebrates. Zooplankton are small (0.2 mm to 4 cm) animals that are fed upon by all species of fish at some time in the fishes life cycle.

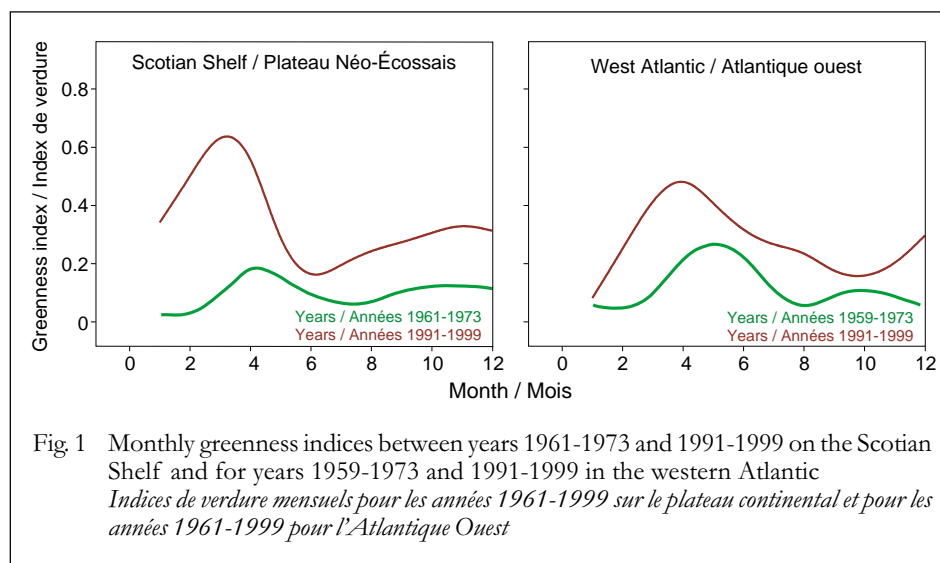


Fig. 1 Monthly greenness indices between years 1961-1973 and 1991-1999 on the Scotian Shelf and for years 1959-1973 and 1991-1999 in the western Atlantic
Indices de verdure mensuels pour les années 1961-1999 sur le plateau continental et pour les années 1961-1999 pour l'Atlantique Ouest

The Continuous Plankton Recorder (CPR) is an instrument that collects phytoplankton and zooplankton on a long continuous ribbon of silk while towed at approximately 7 m depth from commercial ships. Chlorophyll in the phytoplankton stains the silk green. The inten-

sity of the green stain, known as the greenness index, is a measure of the amount of phytoplankton in the water. This index is principally the result of the presence of two main types of phytoplankton known as diatoms and dinoflagellates. The num-

bers of zooplankton by species collected on the silk are also determined. Monthly CPR surveys began in 1959 between Iceland and Newfoundland and in 1961 between Newfoundland and New England. They were discontinued by the late 1970s but were re-started in the early 1990s. The CPR data provide the longest record of changes in plankton abundance and distribution in the northwest Atlantic.

The CPR results show major changes in the abundance of both phytoplankton and zooplankton during the 1990s compared to the 1960s and 1970s (Figs. 1 & 2). The greenness index was significantly higher in the 1990s on both the Scotian Shelf and the Iceland to Newfoundland lines between longitude 45° W and Newfoundland referred to as the western Atlantic. There was also a change in the timing of the peak phytoplankton production, which occurred about 1 month earlier than previously.

The increase in greenness index on the Scotian Shelf was caused by an increase in the abundance of both diatoms and dinoflagellates, whereas, in the western Atlantic it was primarily due to an increase of dinoflagellates.

Phytoplankton in eastern Canadian waters typically has a peak or “bloom” in the spring, declines through the summer, has a minor bloom in the autumn and declines again through the winter. In the 1990s, the spring bloom started earlier in the year and there was relatively high production during more months of the year, including the winter. An increase in the greenness index during the 1990s was also reported in the central northeast Atlantic and the central North Sea.

The data from the eastern Atlantic also show that the increase in the greenness index began in the mid-1980s (Fig. 3). The reasons for this increase in the greenness index are uncertain, but Reid et al. suggested it might be related to “a large export of fresh water from melted ice and permafrost in and around the Arctic Seas as a response to the high positive-temperature anomalies in northern Eurasia and Alaska”. The increase in freshwater may have

resulted in lower salinities and increased stratification that favoured phytoplankton growth. It is interesting to note that salinities have been relatively low and stratification high on the Scotian Shelf during the 1990s.

The abundance of young stages of the zooplankton copepod *Calanus finmarchicus* was significantly lower during 1995 to 1999 compared to the 1960s and 1970s on both the Scotian Shelf and on the line between Iceland and Newfoundland (Fig. 2). The total copepod abundance in both regions during the 1990s did not show a significant trend,

however, because as the numbers of *C. finmarchicus* decreased, there was a corresponding increase in the numbers of other species such as *Paracalanus* and *Pseudocalanus* spp.

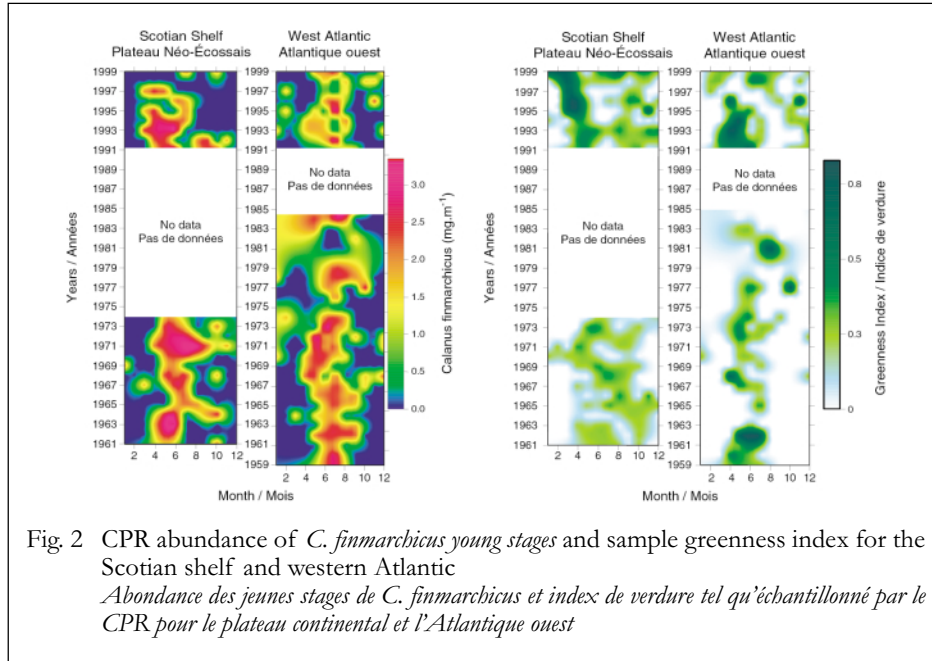


Fig. 2 CPR abundance of *C. finmarchicus* young stages and sample greenness index for the Scotian shelf and western Atlantic
Abondance des jeunes stages de *C. finmarchicus* et index de verdure tel qu'échantillonné par le CPR pour le plateau continental et l'Atlantique ouest

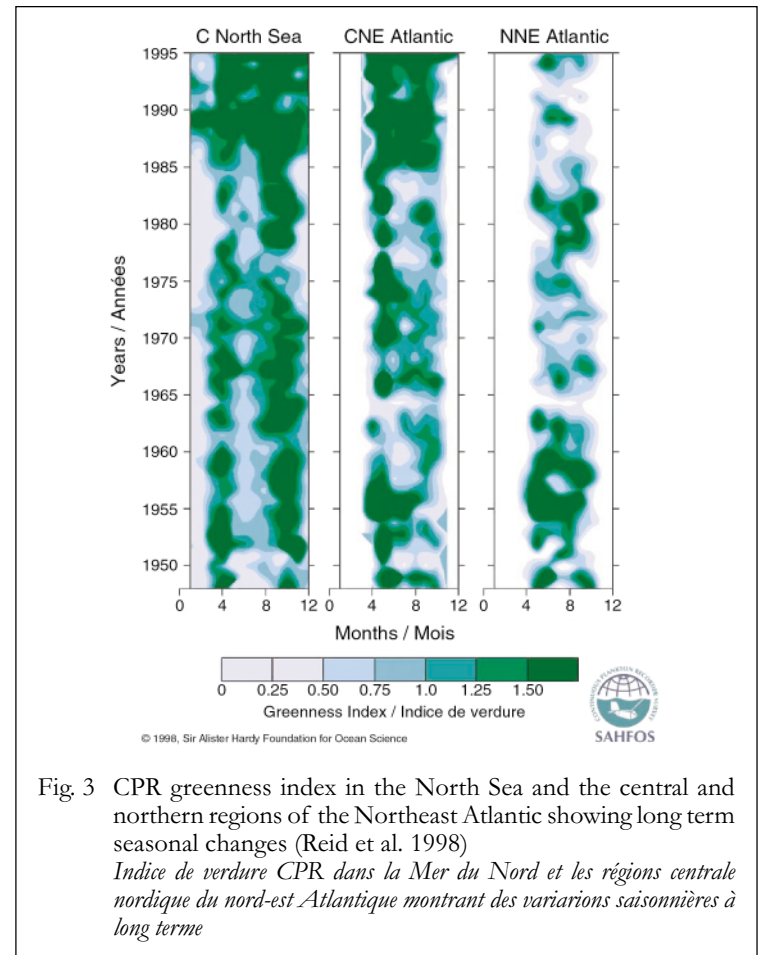


Fig. 3 CPR greenness index in the North Sea and the central and northern regions of the Northeast Atlantic showing long term seasonal changes (Reid et al. 1998)
Index de verdure CPR dans la Mer du Nord et les régions centrale nordique du nord-est Atlantique montrant des variations saisonnières à long terme

The greenness index, as well as of the abundance of *C. finmarchicus*, and the combined *Paracalanus* and *Pseudocalanus* spp. showed similar year-to-year variability on the Iceland-Newfoundland and Scotian Shelf lines (Fig. 2). This, together with the similarity in the greenness index of both sides of the Atlantic Ocean indicate that forces controlling

the variability in the major species of phytoplankton and zooplankton are operating on an ocean basin scale.

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