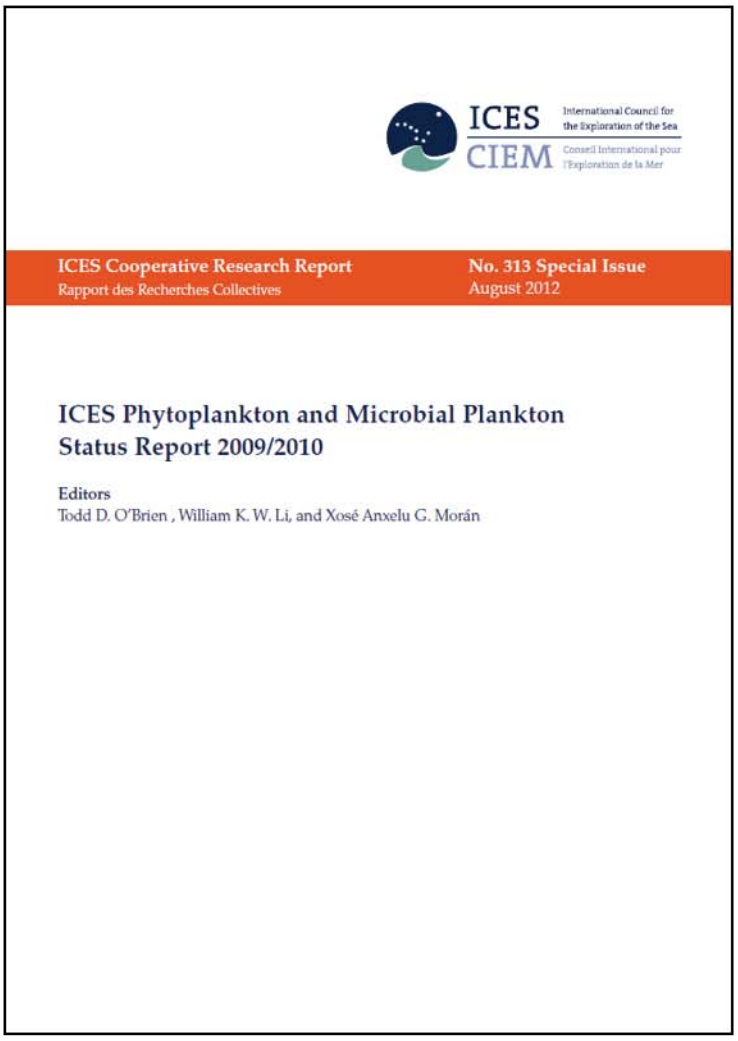


The pages in this PDF contain a single section extracted from the

ICES Plankton and Microbial Plankton Status Report 2009/2010

The full electronic document is available online at:
http://WGPME.net

Full-color printed copies are available from:
http://ICES.dk

O'Brien, T. D., Li, W. K. W., and Morán, X. A. G. (Eds). 2012.
ICES Phytoplankton and Microbial Plankton Status Report 2009/2010.
ICES Cooperative Research Report No. 313. 196 pp.

The time-series analyses and figures used in this report were created using COPEPODITE:
http://www.st.nmfs.noaa.gov/copepodite

6.5 English Channel REPHY sites (Sites 34–35)

Dominique Soudant (primary contact) and Alain Lefebvre

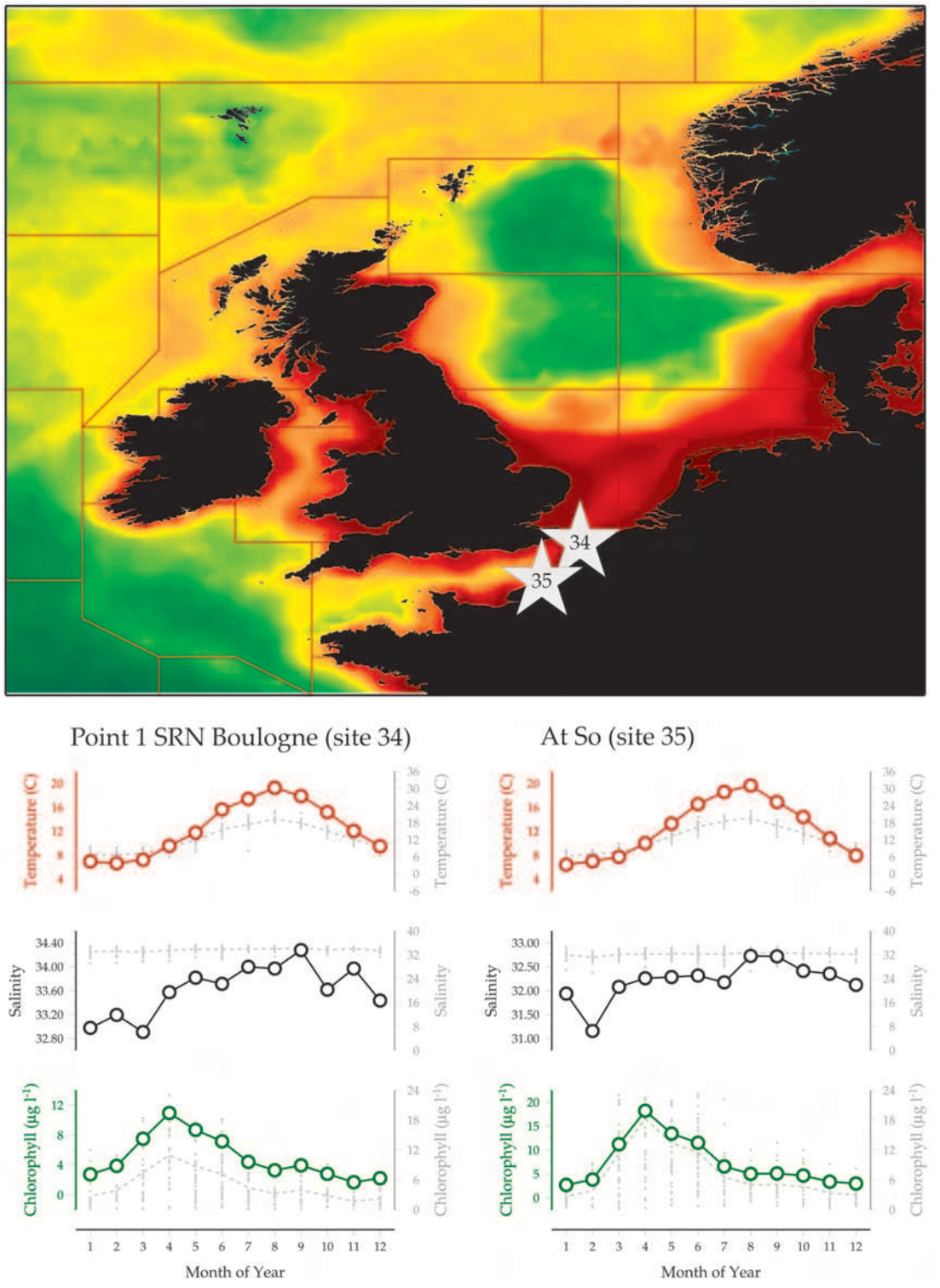


Figure 6.5.1
Locations of the REPHY English Channel plankton monitoring area (Sites 34–35), plotted on a map of average chlorophyll concentration, and their corresponding environmental summary plots (see Section 2.2.1).

The French Phytoplankton and Phycotoxin Monitoring Network (REPHY) was set up in 1984 with three objectives: to enhance knowledge of phytoplankton communities, to safeguard public health, and to protect the marine environment (Belin, 1998). Phytoplankton along the French coast has been sampled up to twice a month since 1987 at 12 coastal laboratories. For that purpose, the French

coast is divided into a hierarchy of sites and subsites common to three regional networks: the English Channel, the Bay of Biscay, and the Mediterranean Sea.

Within the English Channel, the REPHY Point 1 SRN Boulogne and At So sites are both shallow and characterized by a macrotidal regime, especially the latter, which is also more sheltered. Sampling started in 1987 at At So and five years later at Point 1 SRN Boulogne. Ancillary measurements of temperature, salinity, chlorophyll *a* and phaeopigments, inorganic nutrients concentrations, and turbidity are also routinely measured (usually 15 samples per year). Oxygen was incorporated in 2007 at both sites.

Seasonal and interannual trends (Figures 6.5.2, 6.5.3)

Seasonal cycles of chlorophyll as a measure of total phytoplankton biomass are clearly unimodal at both sites, with maxima in April. Chlorophyll values are ca. 50% greater at At So, but peak values at both sites generally exceed 10 µg l^{-1}. Diatom seasonal cycles at both sites featured a summer high and a winter low. Maximum values at Point 1 SRN Boulogne are usually observed in August after exhibiting relatively high values from March onwards, and then decline sharply until reaching minimum values in late autumn. In contrast, the seasonal maximum at At So was earlier in the year (June), with a smoother decline. The seasonal cycle of dinoflagellates at both sites was characterized by maxima in July–August and minima in December–February. A secondary peak in May was also observed at Point 1 SRN Boulogne. The diatoms:diatoms+dinoflagellates ratio covaries at both sites, with marked minima in August. Dominant taxa include *Chaetoceros socialis, Guinardia delicatula,* and various species of *Pseudo-nitzschia* among the diatoms and *Prorocentrum, Protoperidinium,* and *Gymnodinium* among dinoflagellates. *Phaeocystis globosa* is also abundant, especially during the first half of the year.

Increasing salinity has been observed for both time-series, along with significant chlorophyll increases. Total dinoflagellates abundance featured strong increases at both sites ($p < 0.01$), corresponding to strong decreases in the diatoms:diatoms+dinoflagellates ratio at both sites. Diatoms were increasing (non-significant) at the Point 1 SRN site, whereas no apparent trend was found in At So.

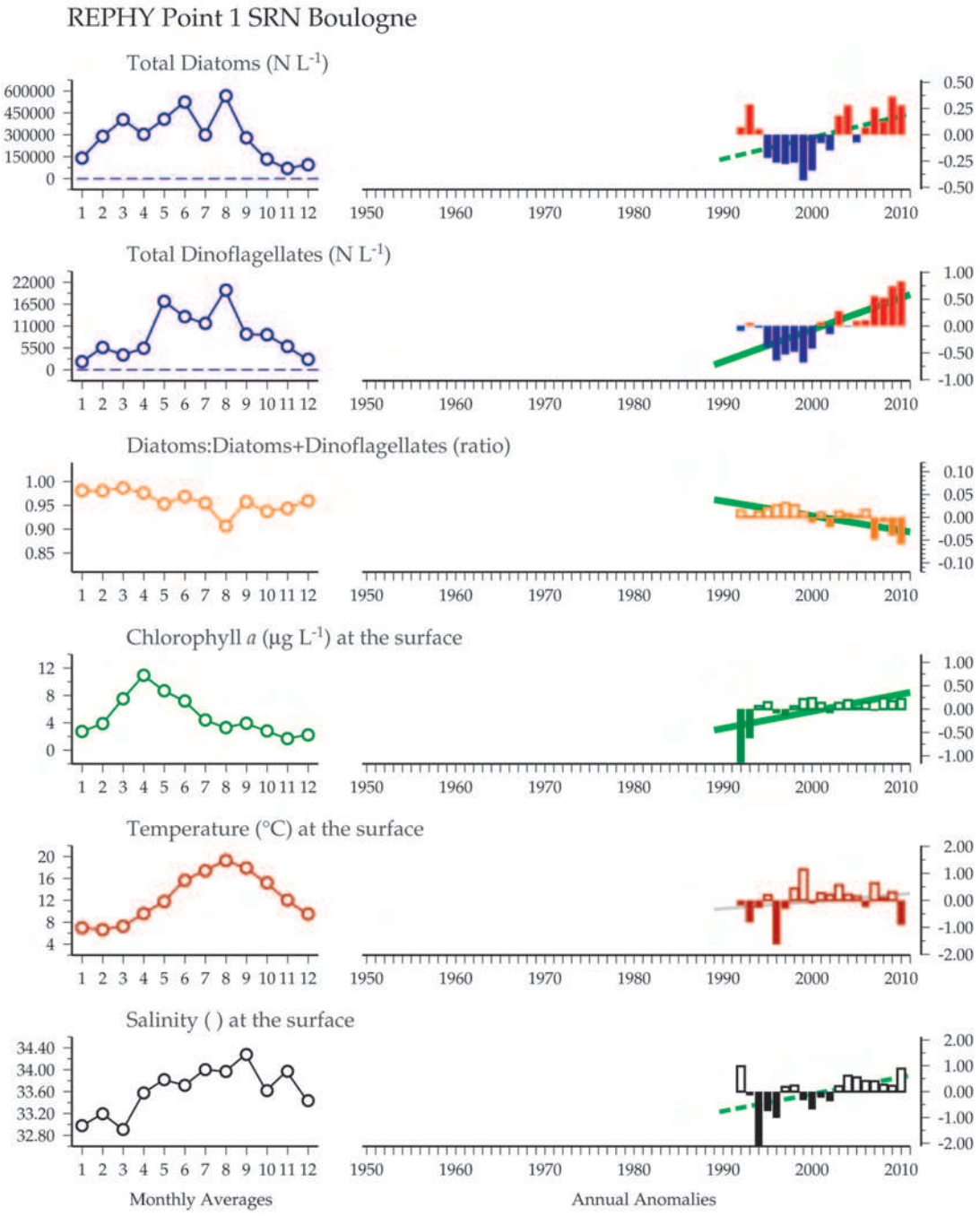


Figure 6.5.2
Multiple-variable comparison plot (see Section 2.2.2) showing the seasonal and interannual properties of select cosampled variables at the REPHY Point 1 SRN Boulogne plankton monitoring site. Additional variables from this site are available online at http://wgpme.net/time-series.

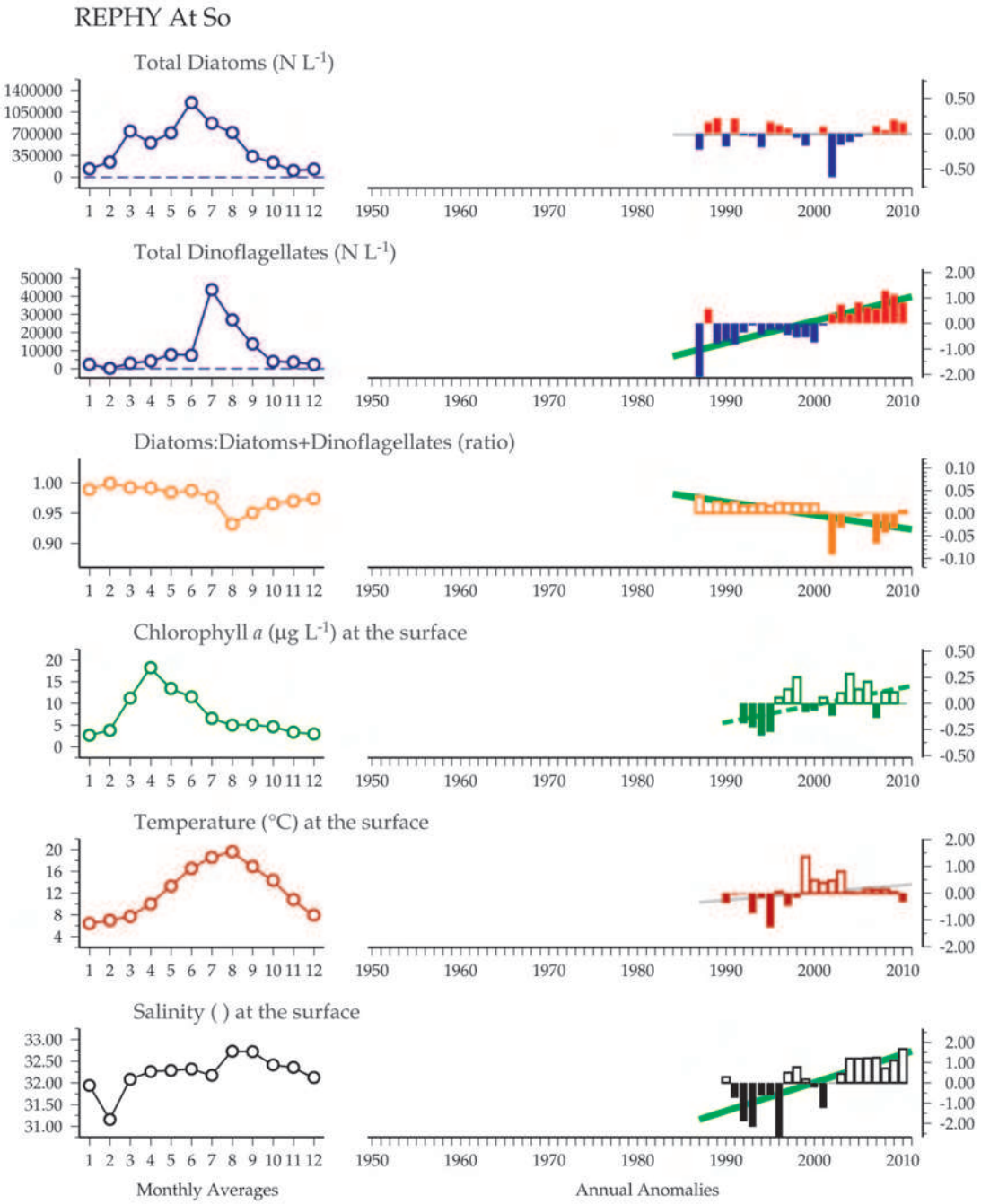
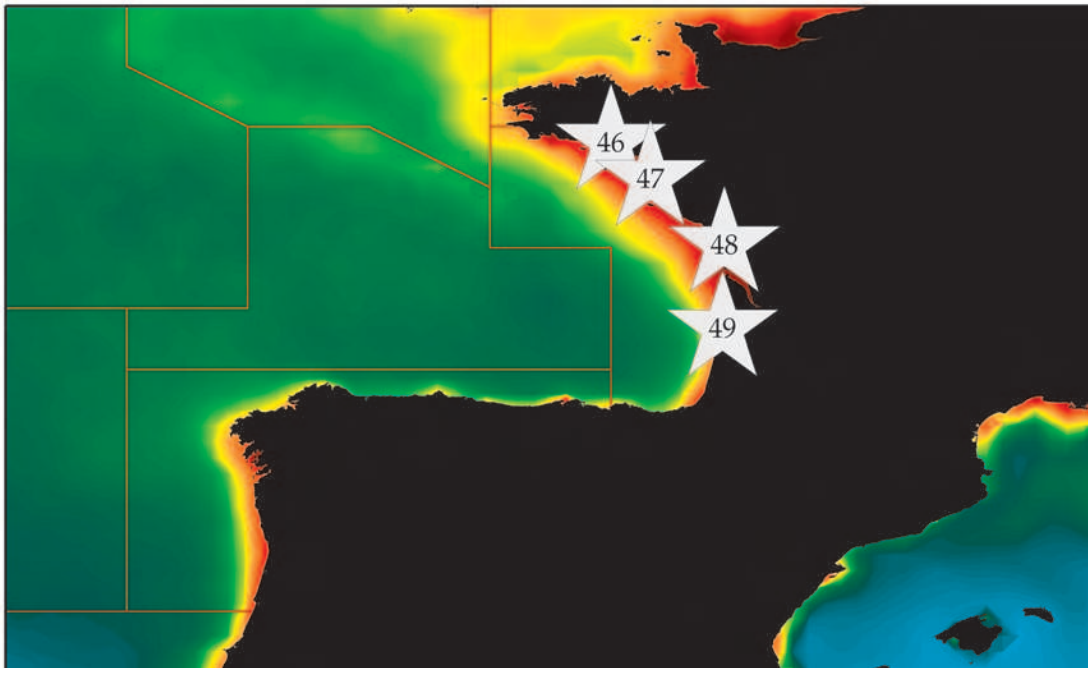


Figure 6.5.3
Multiple-variable comparison plot (see Section 2.2.2) showing the seasonal and interannual properties of select cosampled variables at the REPHY At So plankton monitoring site. Additional variables from this site are available online at http://wgpme.net/time-series.

8.1 Bay of Biscay REPHY sites (Sites 46-49)

Dominique Soudant (primary contact), Myriam Perrière Rumèbe, and Danièle Maurer



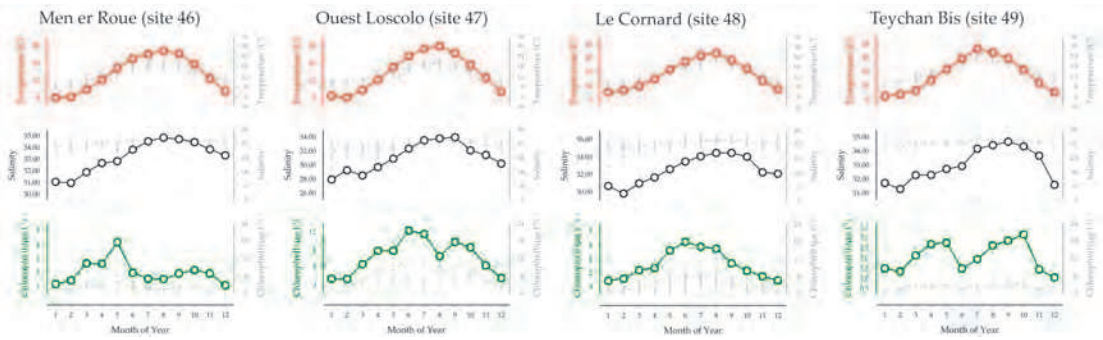


Figure 8.1.1
Locations of the REPHY Bay of Biscay plankton monitoring areas (Sites 46–49), plotted on a map of average chlorophyll concentration, and their corresponding environmental summary plots (see Section 2.2.1).

The French Phytoplankton and Phycotoxin Monitoring Network (REPHY) was set up in 1984 with three objectives: to enhance knowledge of phytoplankton communities, to safeguard public health, and to protect the marine environment (Belin, 1998). Phytoplankton along the French coast has been sampled up to twice a month since 1987 at twelve coastal laboratories. The French coast is divided into a hierarchy of sites and subsites common to three regional networks: the English Channel, the Bay of Biscay, and the Mediterranean Sea. Men er Roue, Ouest Loscolo, Le Cornard, and Teychan Bis are four REPHY sites in the Bay of Biscay. These sites are all shallow, meso- to macrotidal, with differing wave exposure from sheltered in Teychan Bis to moderately exposed at Ouest Loscolo and Le Cornard.

From 1987 onwards, the basic environmental variables salinity, temperature, and turbidity are measured together with phytoplankton composition and abundance. Variables such as inorganic nutrient concentrations chlorophyll *a*, pheopigments, and oxygen were included in the time-series of most of the sites later in different years.

Seasonal and interannual trends (Figure 8.1.2–8.1.5)

Seasonal cycles of chlorophyll as a measure of total phytoplankton biomass are bimodal at Men er Roue (Figure 8.1.2), Ouest Loscolo (Figure 8.1.3), and Teychan Bis (Figure 8.1.5), with maxima generally found in May/June and September/October, which, at the latter site, are even of greater magnitude than the spring peak, and unimodal

at Le Cornard (Figure 8.1.4), with an annual maximum in June. Although dinoflagellates at the sites usually exhibited unimodal cycles, peaking around August, the Teychan Bis site was bimodal, with a strong May peak followed by a weaker August increase. Diatoms at Men er Roue, Ouest Loscolo, and Le Cornard were bimodal, with peaks in May/June and September/October in accordance with chlorophyll cycles. Diatoms at Le Cornard were unimodal, with a strong peak in March and a slow, steady decrease onwards. Dominant diatom species common to all sites include *Skeletonema costatum* and *Leptocylindrus minimus*, with *L. danicus* important at Ouest Loscolo and Teychan Bis. *Asterionellopsis glacialis* may be frequent in blooms at Teychan Bis year-round. *Pseudo-nitzschia* sp. blooms appeared more frequently in the last two years. Dinoflagellates include several species of *Prorocentrum* and *Protoperidinium. Lepidodium chlorophorum* may form summer blooms locally.

Long-term trends for *in situ* temperature, salinity, and chlorophyll are not significant at any of the Bay of Biscay REPHY sites. However, some significant tendencies have been identified in the large phytoplankton groups. Total diatom abundance has increased significantly at the Ouest Loscolo ($p< 0.05$) and Le Cornard ($p< 0.01$) sites. Total dinoflagellate abundance has also increased at both sites, but only Le Cornard's trend was significant ($p< 0.05$). At the Men er Roue and Teychan Bis sites, diatoms and dinoflagellate totals were both decreasing (but without statistical significance). The diatoms:diatoms+dinoflagellates ratio was decreasing at the Teychan Bis site ($p< 0.05$) and at the Ouest Loscolo site (non-significant).

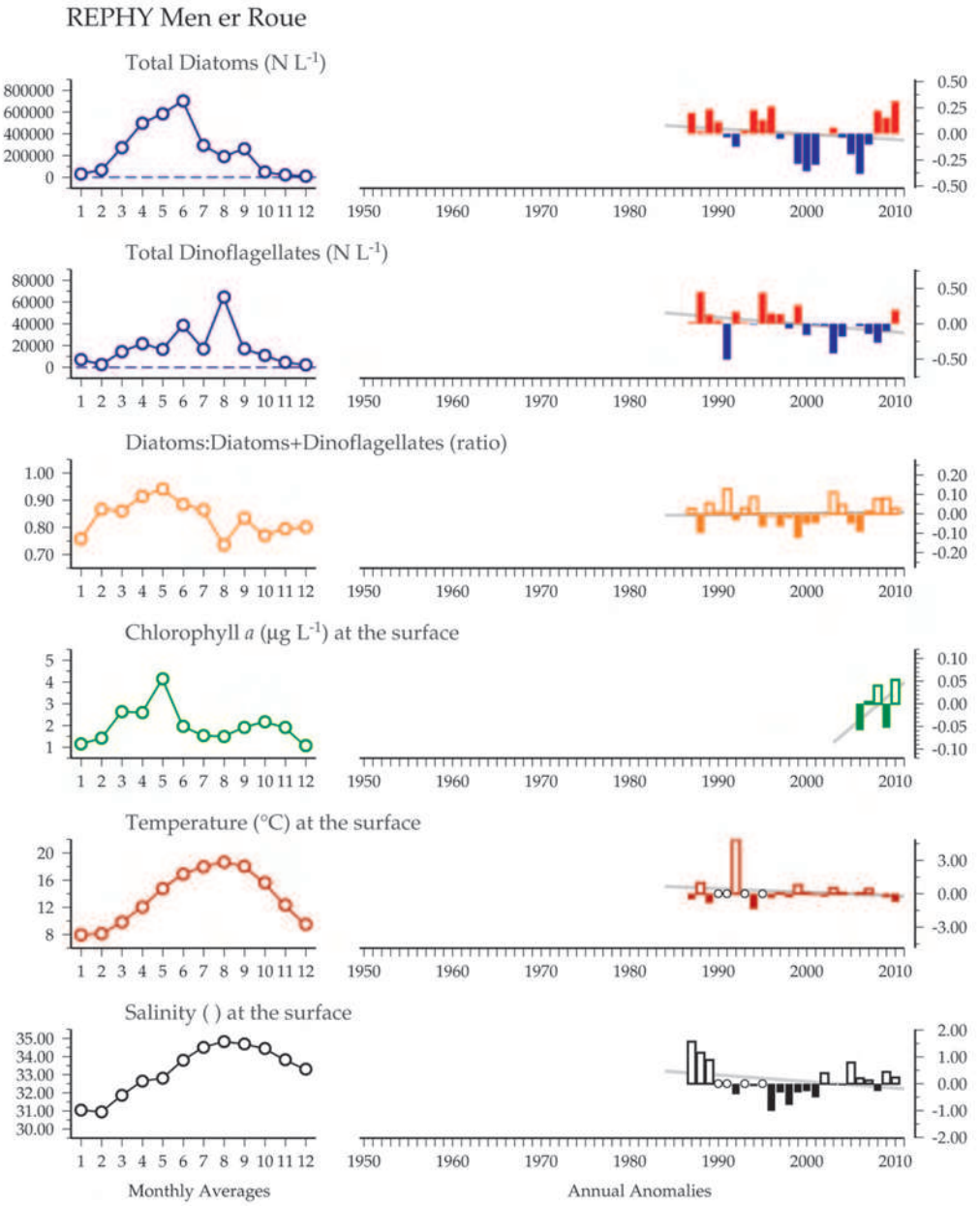


Figure 8.1.2
Multiple-variable comparison plot (see Section 2.2.2) showing the seasonal and interannual properties of select cosampled variables at the Men er Roue plankton monitoring site. Additional variables from this site are available online at http://wgpme.net/time-series.

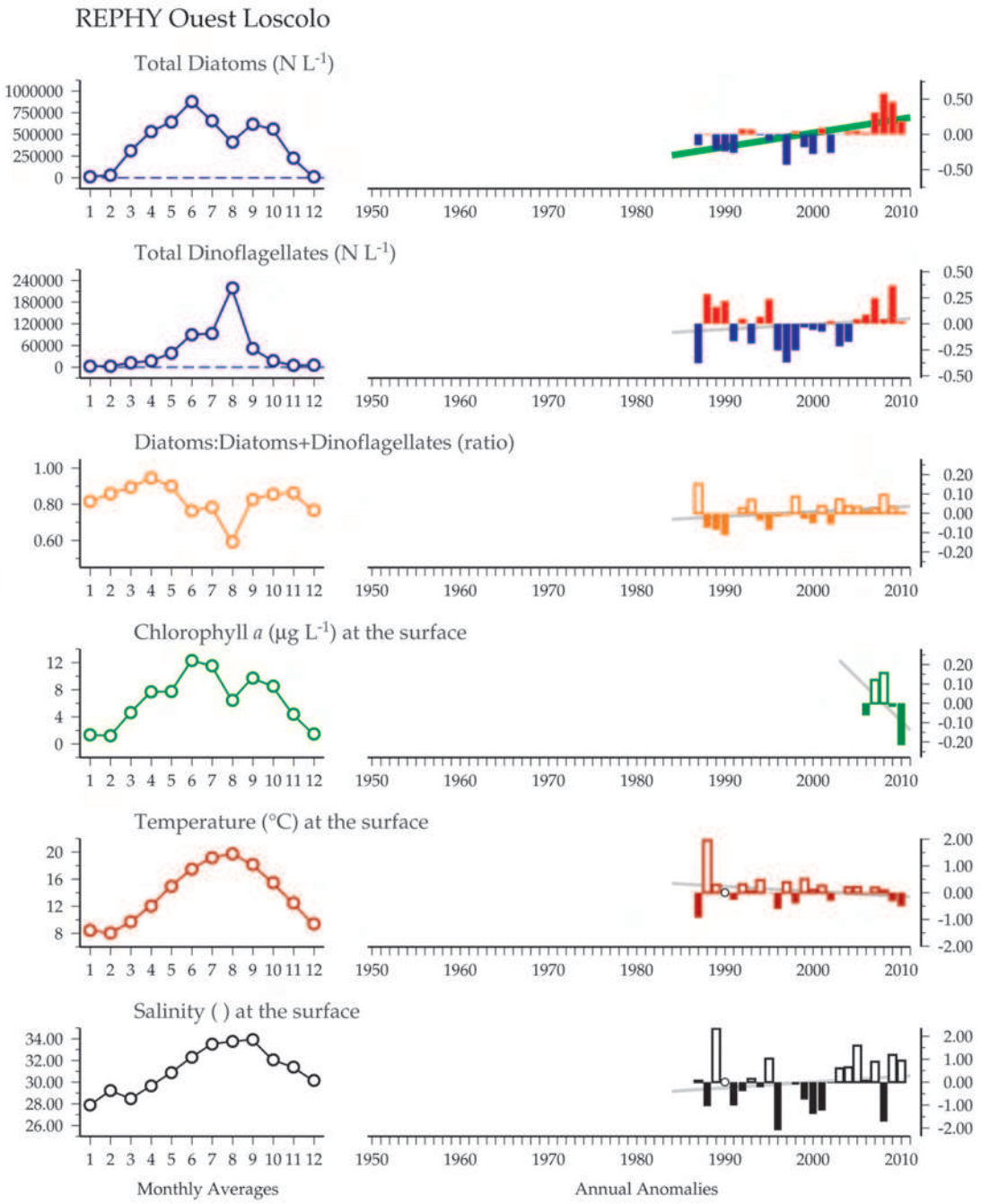


Figure 8.1.3
Multiple-variable comparison plot (see Section 2.2.2) showing the seasonal and interannual properties of select cosampled variables at the Ouest Loscolo plankton monitoring site. Additional variables from this site are available online at http://wgpme.net/time-series.

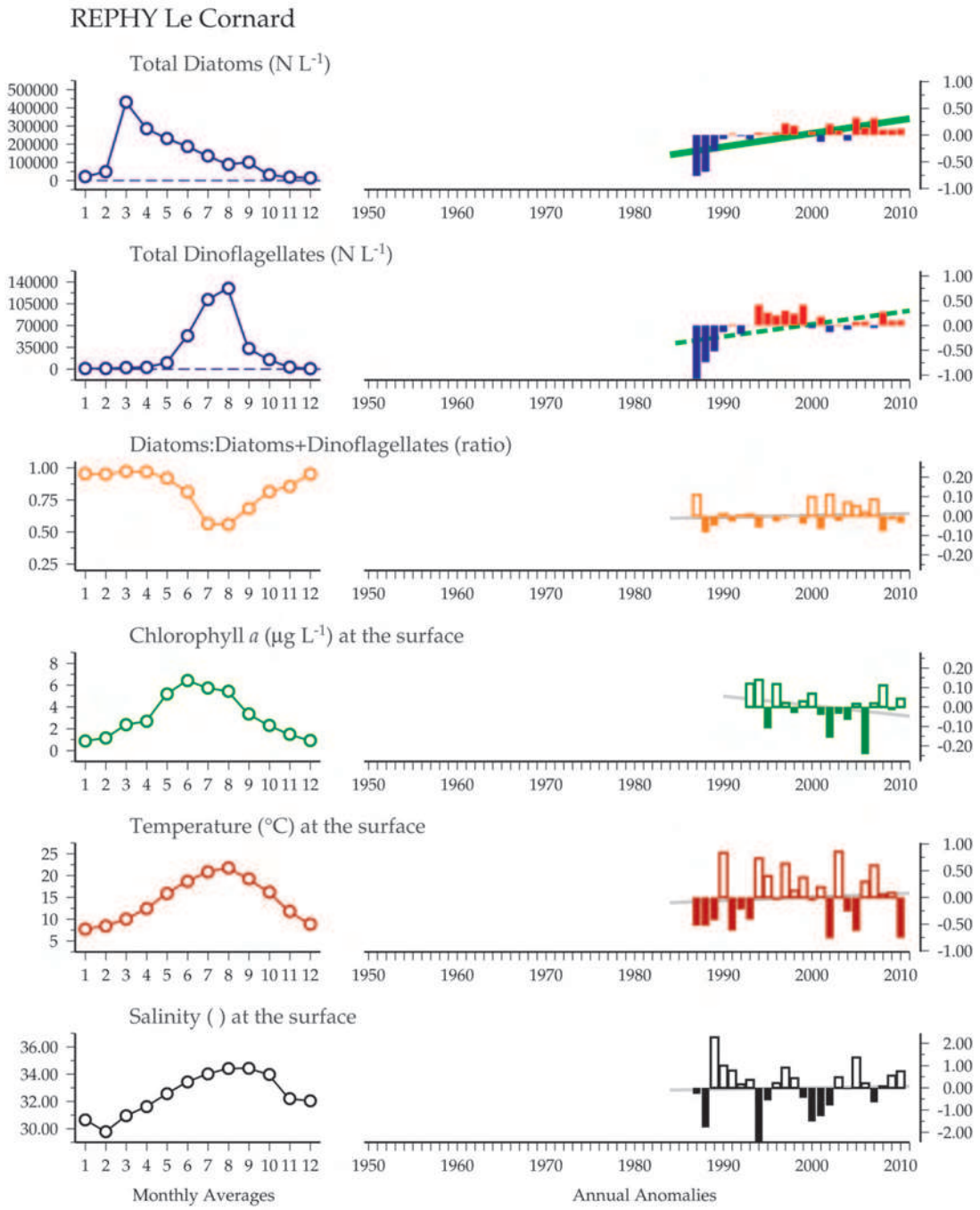


Figure 8.1.4
Multiple-variable comparison plot (see Section 2.2.2) showing the seasonal and interannual properties of select cosampled variables at the Le Cornard plankton monitoring site. Additional variables from this site are available online at http://wgpme.net/time-series.

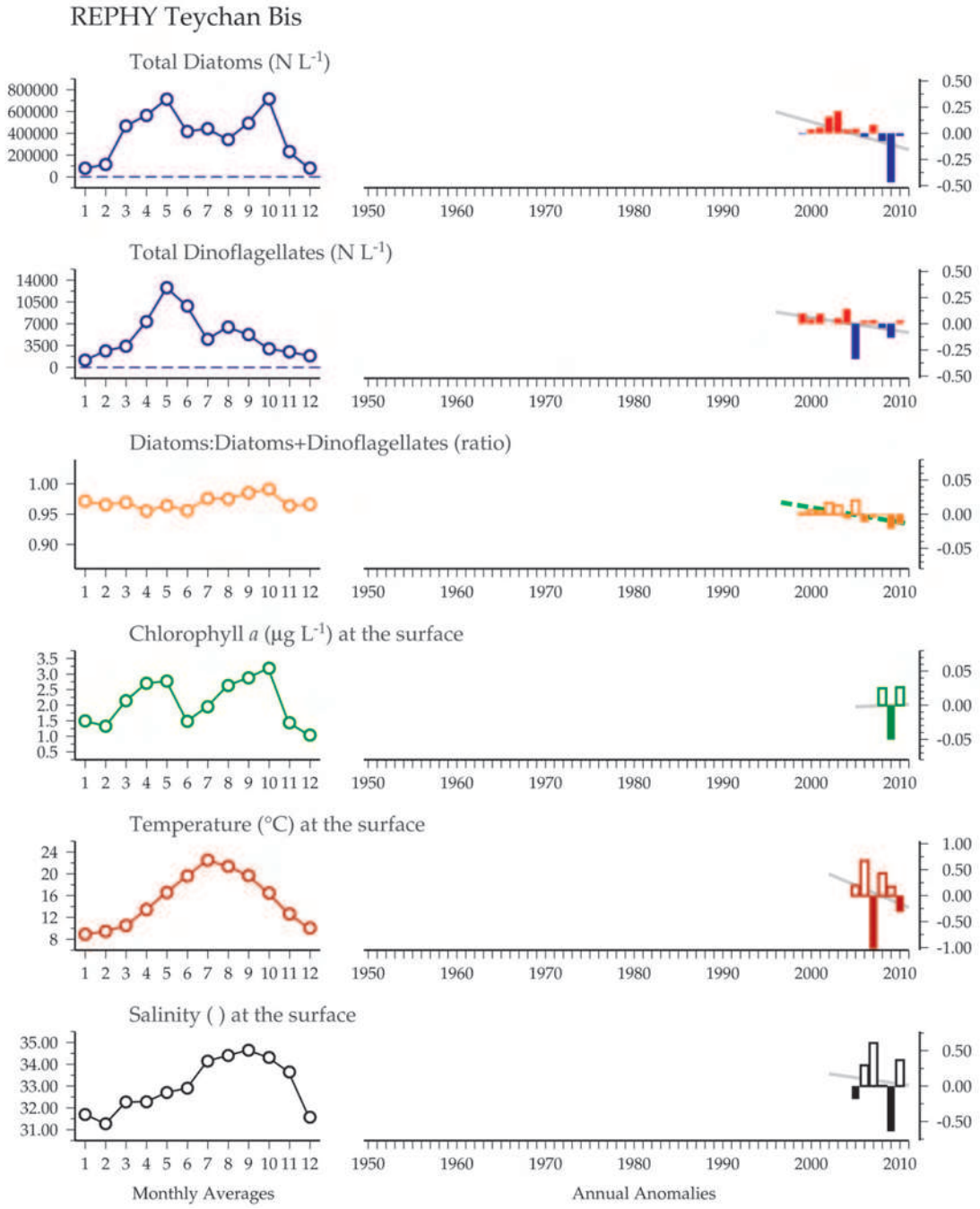


Figure 8.1.5
Multiple-variable comparison plot (see Section 2.2.2) showing the seasonal and interannual properties of select cosampled variables at the Teychan Bis plankton monitoring site. Additional variables from this site are available online at http://wgpme.net/time-series.

9.3 Mediterranean REPHY sites (Sites 57–58)

Dominique Soudant

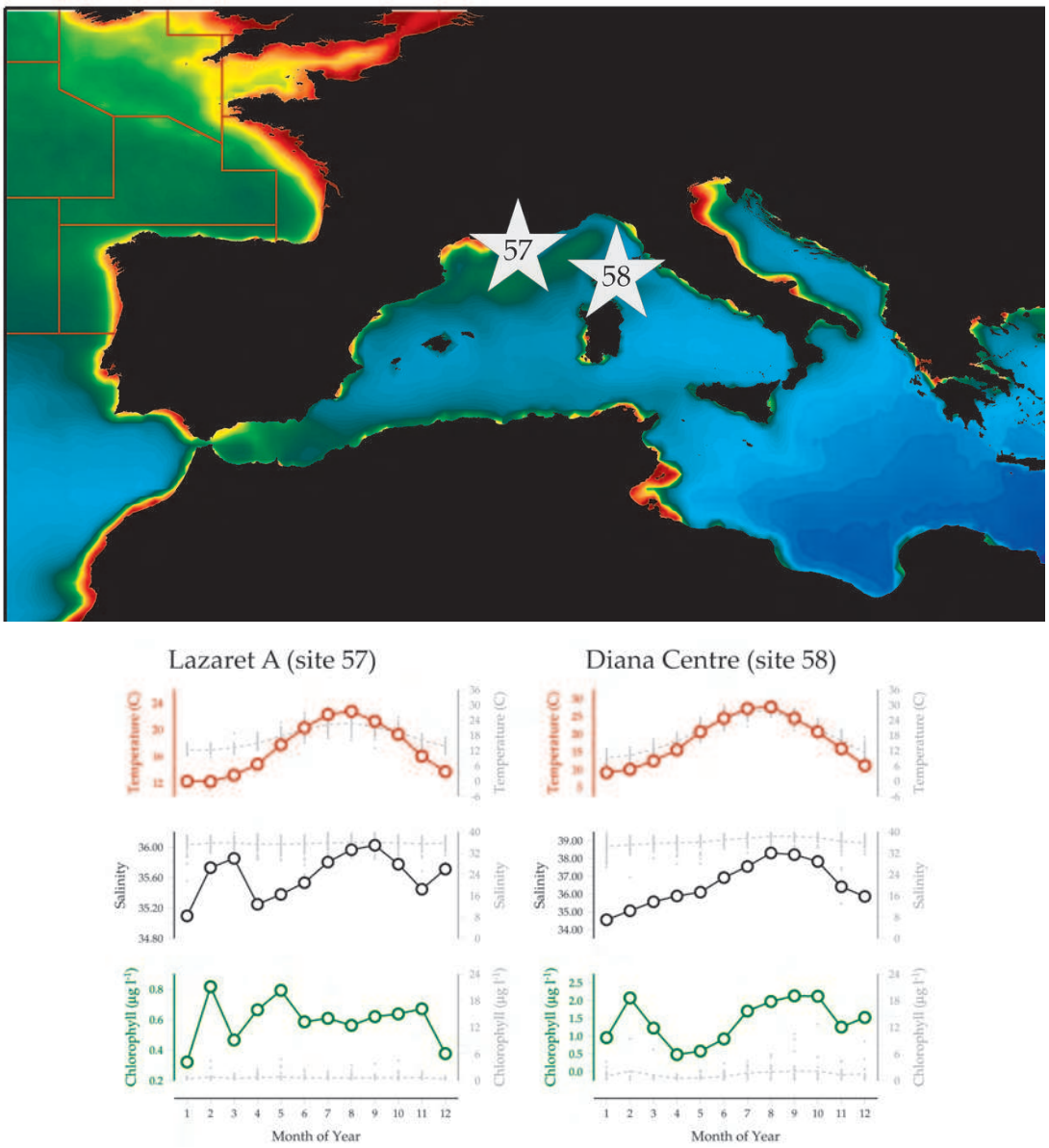


Figure 9.3.1
Locations of the REPHY Mediterranean Sea plankton monitoring areas (Sites 57–58), plotted on a map of average chlorophyll concentration, and their corresponding environmental summary plots (see Section 2.2.1).

The French Phytoplankton and Phycotoxin Monitoring Network (REPHY) was set up in 1984 with three objectives: to enhance knowledge of phytoplankton communities, to safeguard public health, and to protect the marine environment (Belin, 1998). Phytoplankton along the French coast has been sampled up to twice a month since 1987 at twelve coastal laboratories. For that purpose, the French coast is divided into a hierarchy of sites and subsites common to three regional networks: the English Channel, the Bay of Biscay, and the Mediterranean Sea. Lazaret A and Diana Centre (Figure 9.3.1) are two Mediterranean REPY sites. Lazaret A is located in well-mixed waters, with a medium-depth, sandy bottom within Toulon Bay. Diana Center is located in shallow, less-mixed waters of a coastal lagoon in Corse and features a muddy bottom.

As with the Bay of Biscay and English Channel REPHY sites, sampling started in 1987, with salinity, temperature, turbidity, and oxygen measured concomitantly from the beginning or one year thereafter. Chlorophyll *a* and pheopigments started at Diana Centre in 1988 and at Lazaret A in 1999. This latter site is sampled twice a month on average, whereas fewer samples (17 on average from 10 months) are taken annually at Diana Centre.

Seasonal and interannual trends (Figures 9.3.2–9.3.3)

Chorophyll annual cycles show maximum values in late winter at both sites, but equally high values are also observed in late summer at Diana Centre. At this latter site, chlorophyll values are well above 1 µg l^{-1} for most of the year, whereas chlorophyll remains below this value through the year at Lazaret A. Diatom abundance tends to fluctuate year-round, exhibiting maxima in late summer (September) at both sites, with relatively high values also in February (Lazaret A) and December (Diana Centre). Dinoflagellates peaked early in the year (winter–spring) at Lazaret A, whereas those at Diana Centre peaked in October and December. Diatoms include *Chaetoceros* at both sites, with species such as *Skeletonema costatum* and *Pseudo-nitzschia* more abundant at Lazaret A and *Asterionellopsis glacialis*, *Dactyliosolen fragilissimus*, and *Hemiaulus* sp. at Diana Centre. Common genera of dominant dinoflagellates are *Prorocentrum*, *Bysmatrum*, *Scrippsiella*, and *Ensiculifera*, although species may be different at both sites.

Salinity has been steadily increasing for more than two decades at both Mediterranean REPHY sites. A significant ($p < 0.05$) increase in total phytoplankton (as chlorophyll) is observed at Lazaret A, probably owing to a concomitant significant ($p < 0.01$) increase in diatom abundance, whereas a long-term decrease in dinoflagellate abundance was conspicuous ($p < 0.01$) at both sites. Consequently, a significant increase in the diatoms:diatoms+dinoflagellates ratio was observed at both sites, more marked at Lazaret A.

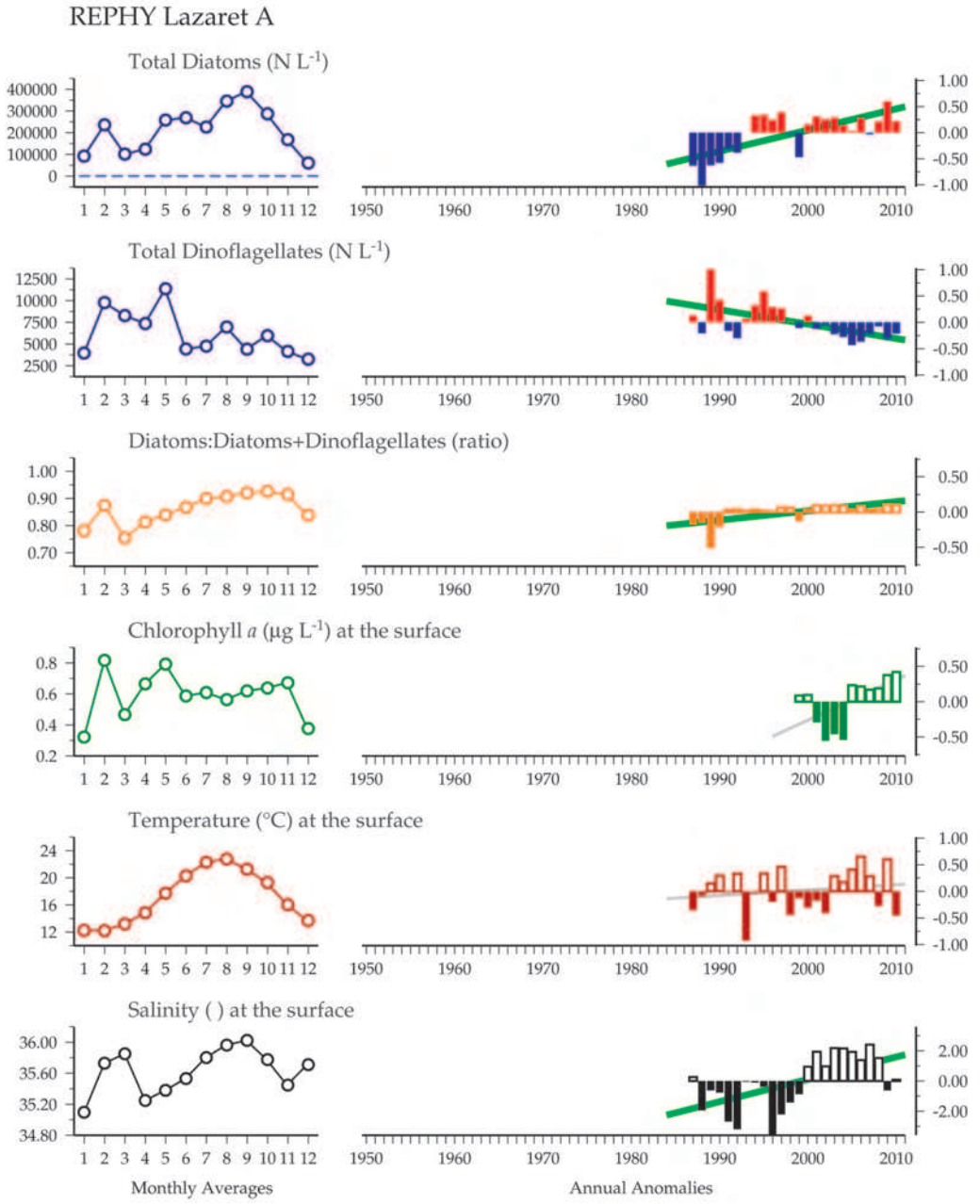


Figure 9.3.2
Multiple-variable comparison plot (see Section 2.2.2) showing the seasonal and interannual properties of select cosampled variables at the REPHY Lazaret A plankton monitoring site. Additional variables from this site are available online at http://wgpme.net/time-series.

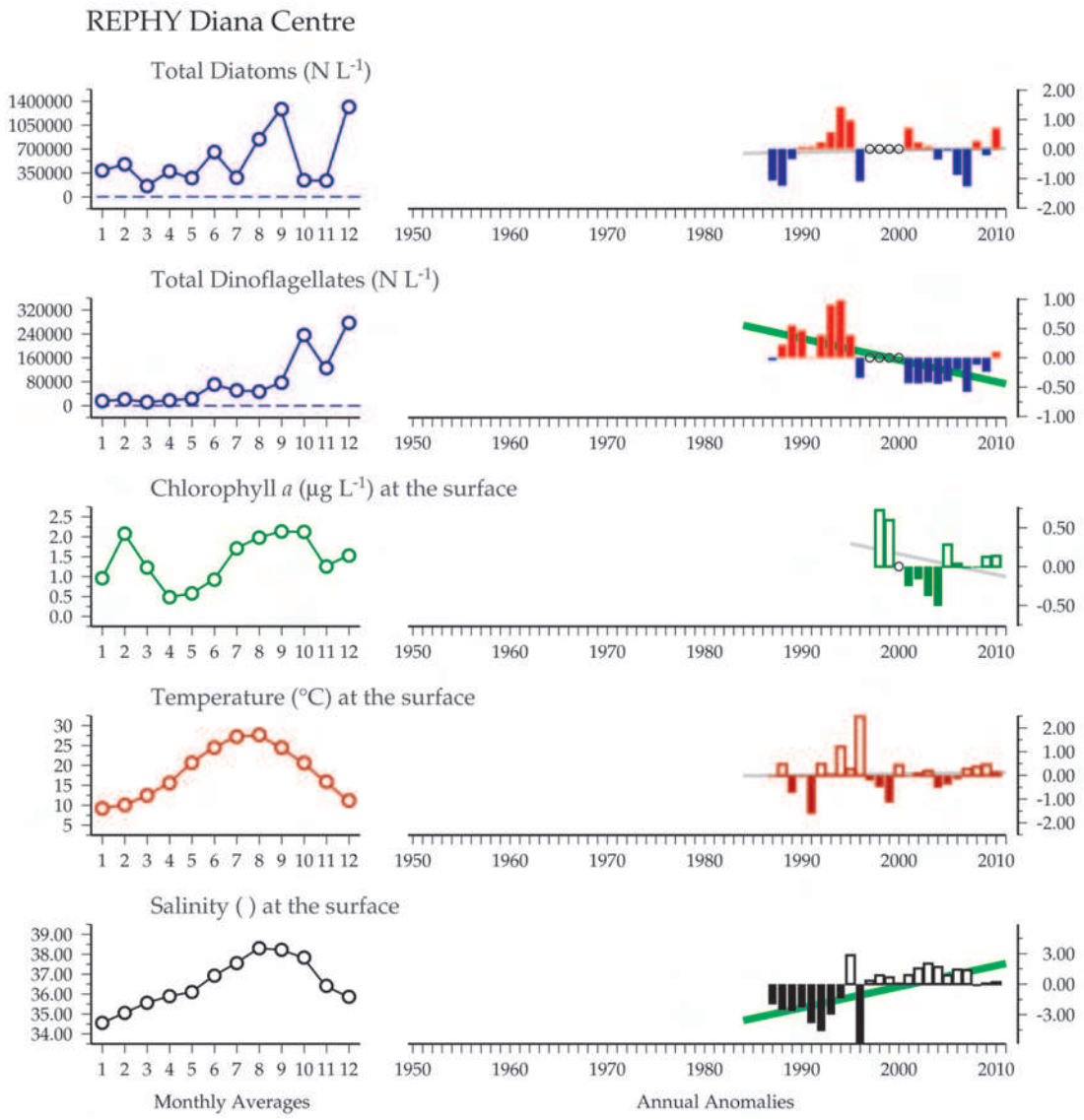


Figure 9.3.3
Multiple-variable comparison plot (see Section 2.2.2) showing the seasonal and interannual properties of select cosampled variables at the REPHY Diana Centre plankton monitoring site. Additional variables from this site are available online at http://wgpme.net/time-series.