

Will establishment of an introduced red alga result in local biodiversity changes?

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Introduction

The Pacific red alga *Heterosiphonia japonica* was first observed in Europe in 1994, and since then it has had a rapid dispersal along European shores. This species is now recorded from the Netherlands, Northern Spain, Norway, Sweden, Scotland, England, and the Atlantic and Mediterranean coast of France.

When a non-native species establishes in a new region the question arises if this species will have a negative impact on native communities. As *H. japonica* has recently been observed in high abundances in many habitats of the Norwegian southwest coast, the purpose of this study was to investigate if this species might have had a negative impact on the local composition and biodiversity of native algal species in this area.

Material & Methods

Prior to the establishment of *H. japonica*, the species composition of macroalgae was investigated by Brattenborg (1997) at 14 localities in the Florø area in 1994 (Figure 1). Using the same methods in 2003 we carried out a new investigation of the same localities. Algal material was sampled by three dredgings at each locality. The localities were grouped into two depth intervals (5-15 m and 16-28 m). All macroalgal species with the exception of microscopic, crustose and coralline species were recorded. A similarity percentage analysis (Simpser) was used to identify the most important species contributing to the difference in macroalgal composition between years.

Results

- The total number of species was approximately the same in 2003 as in 1994.

- With regard to the composition and number of species, we did not find that localities with high abundance of *H. japonica* differed from localities with low or no abundance (Figure 2 A, B).

- During this investigation the number of species recorded at each locality was higher in nine of the localities and slightly lower in five (Figure 2 B).

- The temporal differences were mainly caused by an increased frequency of 'southern species' (species with a northern limit on our coast) (Figure 3).

- The percentage share of 'southern species' of the total number of species was higher in this investigation than in the previous study (5 % higher in the deep interval, 12 % higher in the shallow interval).

Conclusions

- In the relatively short time span since its introduction, the establishment of *H. japonica* does not appear to have had a negative impact on species richness in the area.

- The temporal changes observed in this area since the first investigation were most likely caused by several recent warm summers/autumns and mild winters. Such conditions may favour a high abundance of species which have their main distribution area south of Norway.

- This study constitutes an important baseline study for further monitoring of possible long-term changes in local biodiversity and community structure in these subtidal habitats.

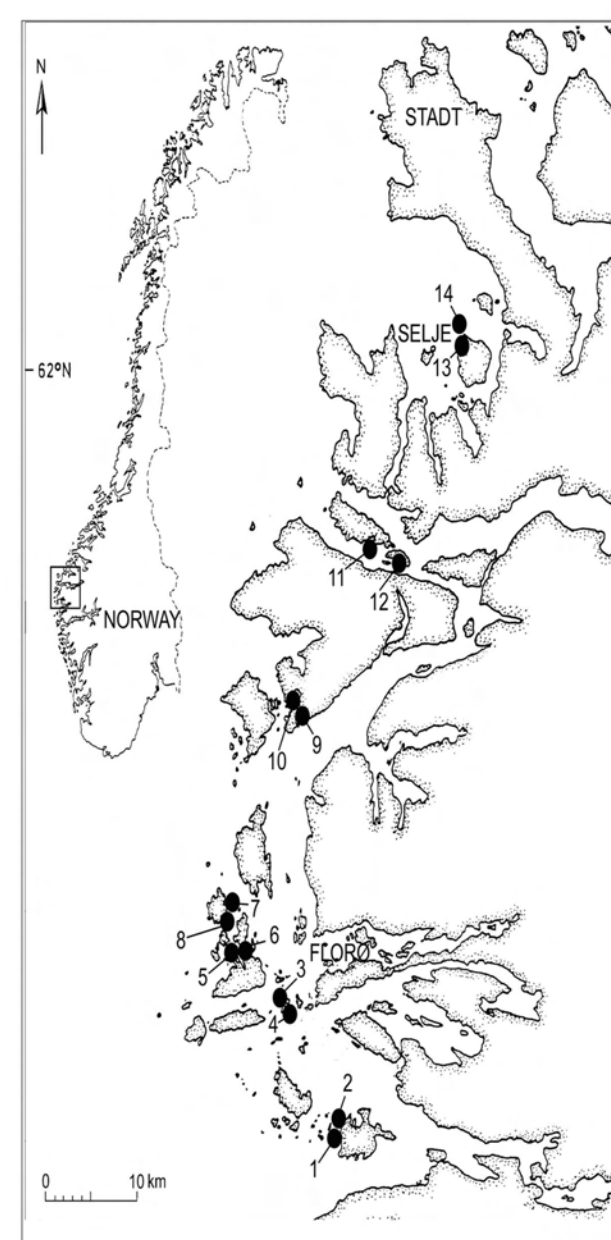
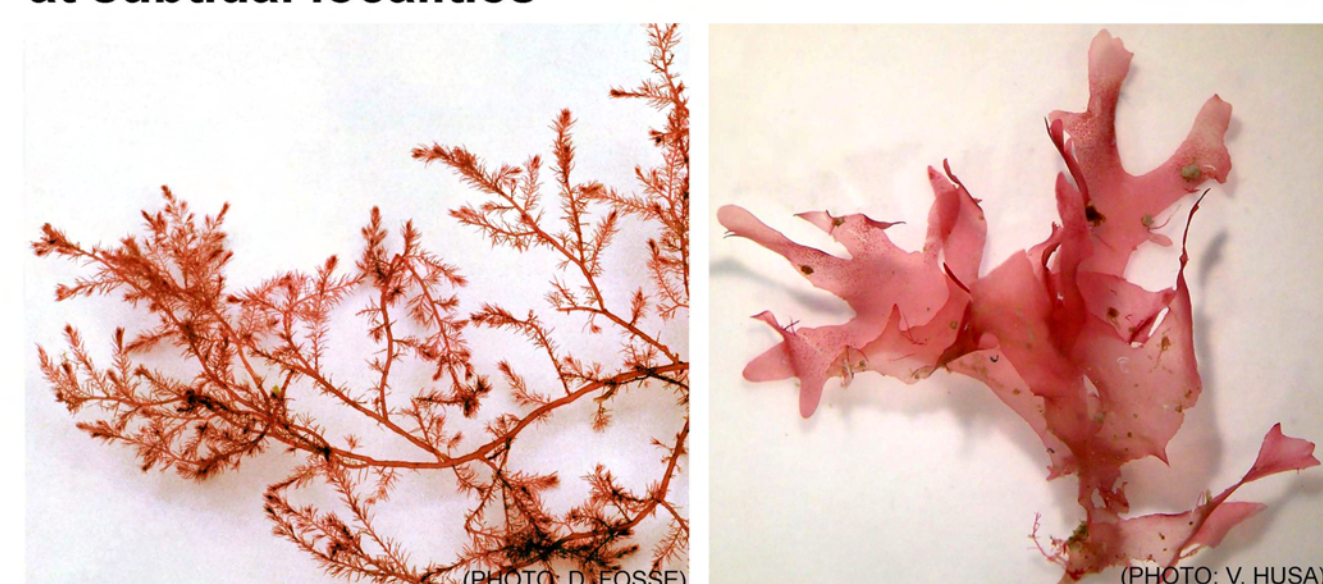


Figure 1. The study area is situated in the Sogn and Fjordane County on the Norwegian west coast. (Map drawing: Elin Holm)

Some of the 'southern species' contributing most to the temporal differences in species composition at subtidal localities



Heterosiphonia japonica, Pacific species recorded in the Florø area for the first time in 1997. Found on 12 localities in 2003.

Rhodophyllis divaricata, southern species with a distribution north to Steigen in Nordland. Recorded for the first time in the area at three localities in 1994, present at 12 localities in 2003.



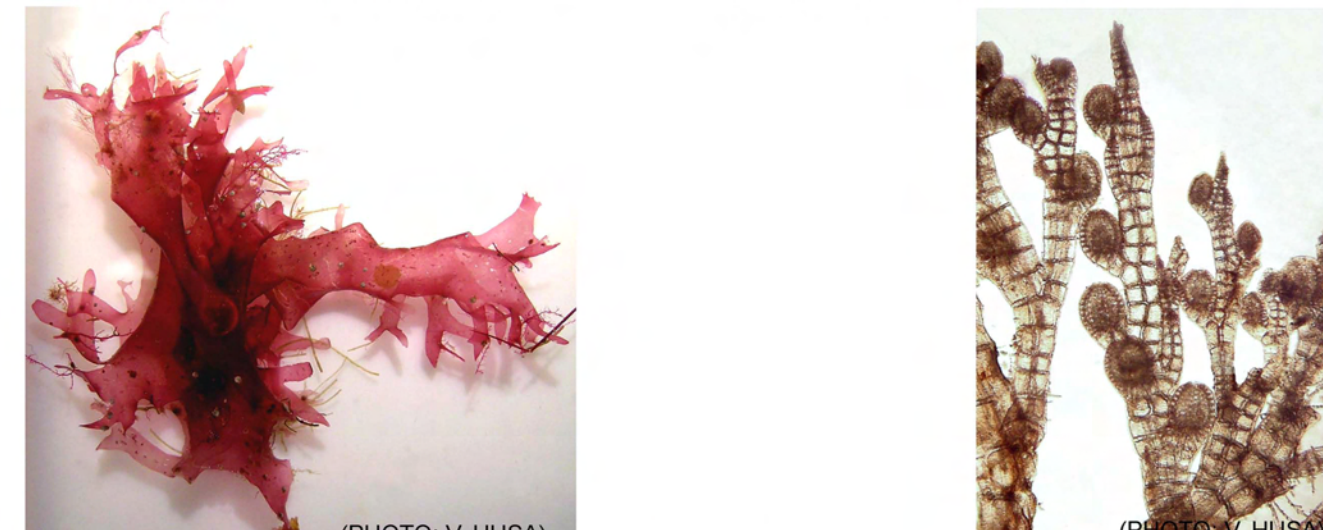
Chylocladia verticillata has a northern limit in North Trøndelag. Recorded at two localities as the first registration in the area in 1994, present at 10 localities in 2003.

Brongniartella byssoides, southern species distributed north to Troms. Recorded at three localities in 1994, present at nine localities in 2003.



Gracilaria gracilis, warm water species recorded to Møre and Romsdal. Found at two localities in 1994 and present at seven in 2003.

Sphacelaria caespitula, southern species with a distribution to Troms. Recorded at four localities in 1994 and nine in 2003.



Nitophyllum punctatum, species only recorded along the coast from Hordaland to Trondhjemsfjorden. Recorded for the first time at four localities in the Florø area by Brattenborg in 1994, present at seven localities in 2003.

Neosiphonia harveyi, species introduced from the North Pacific (1983) with the northernmost record from Møre and Romsdal. Not present in the Florø area in 1994, but recorded at five localities in 2003.



Acrotrix gracilis, rare species with sporadic registrations north to Senja in Troms. Not recorded in 1994, quite common at four localities in 2003.

Dictyota dichotoma, southern species with a northern limit in South Trøndelag. Not recorded by Brattenborg in 1994, present at four localities in 2003.



Cutleria multifida, the gametophytic stage of this species has a northern limit near Kristiansund in Møre and Romsdal. This stage of the species was not recorded in the area in 1994, but was quite common at five localities in 2003.

Haraldiophyllum bonnemaisonii, Several specimens of an unknown species were found at two localities near Selje Island in 2003. Fabio Rindi (University in Galway, Ireland) identified this species to *Haraldiophyllum*. If this is correct it is the first record of this species in Norway. *H. bonnemaisonii* is known from the British Isles. (Pressed fertile female specimen).

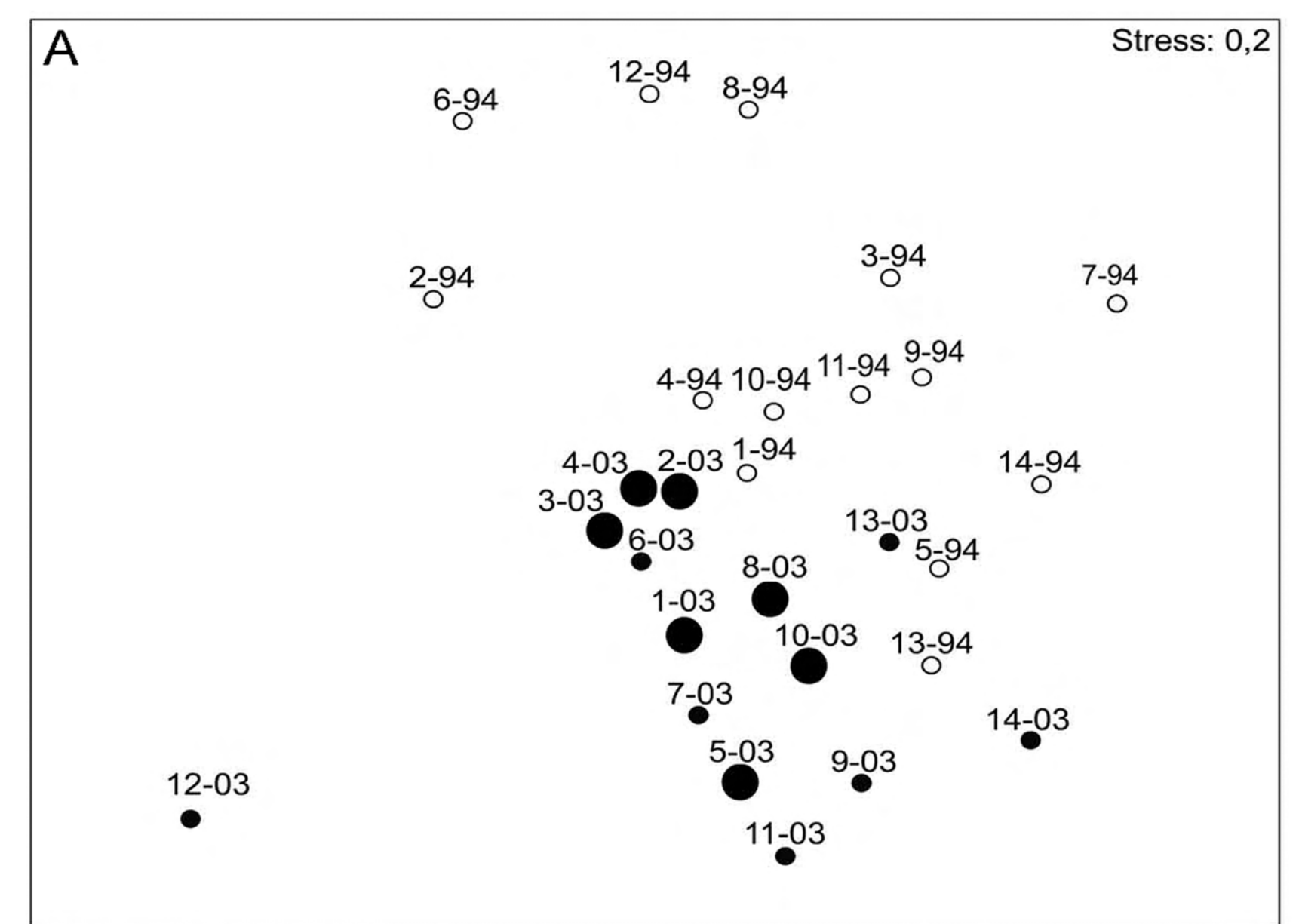
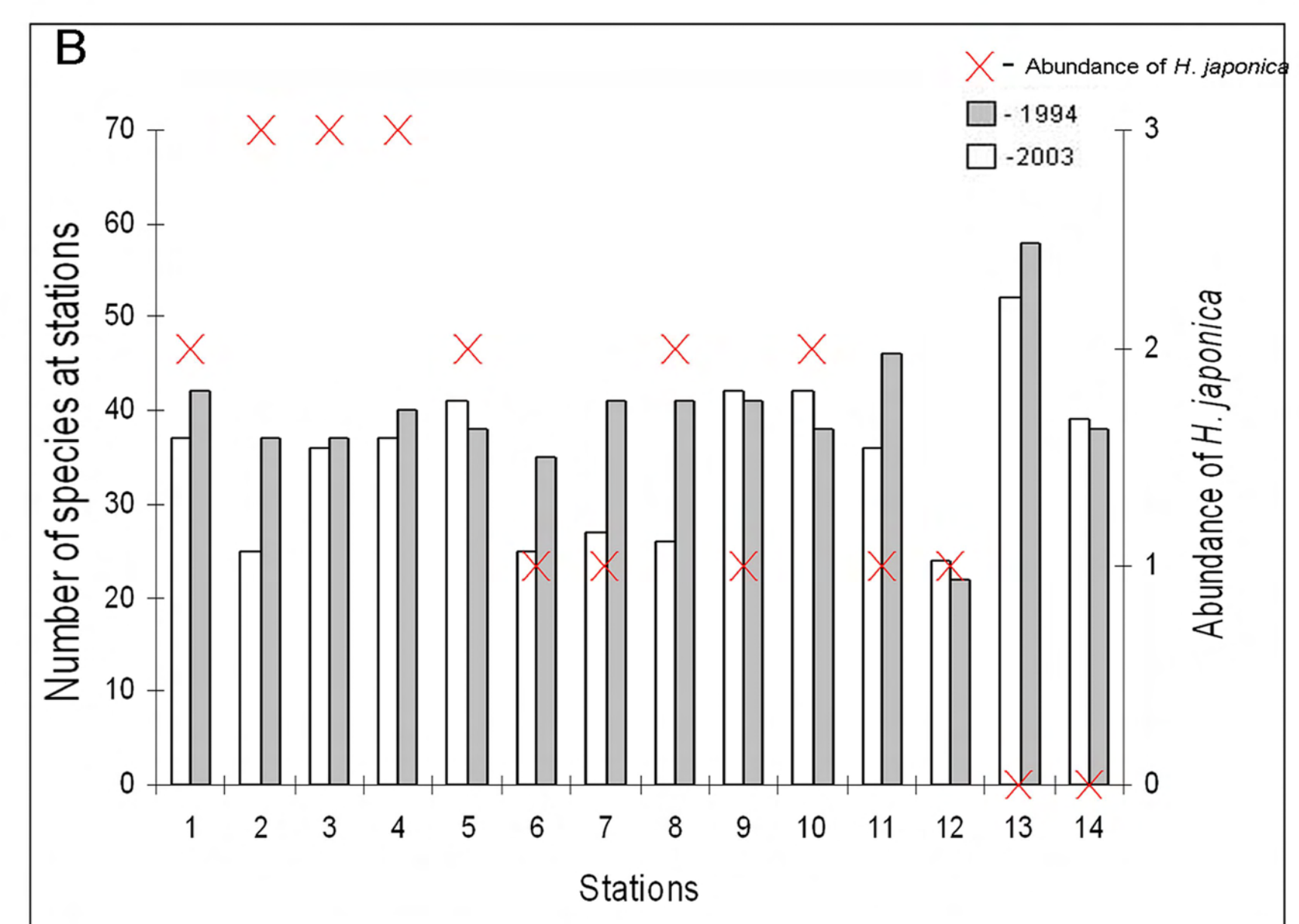


Figure 2. A. Similarities between localities investigated in 1994 and 2003. Open circles = 1994, black circles = 2003, large black circles demonstrate the localities where *Heterosiphonia japonica* was common or in high abundance.



B. Macroalgal species richness at subtidal localities investigated in 1994 and 2003. The abundance of *H. japonica* at each locality was recorded on a semi quantitative scale. (0 = not found, 1 = rare, 2 = common, 3 = plenty).

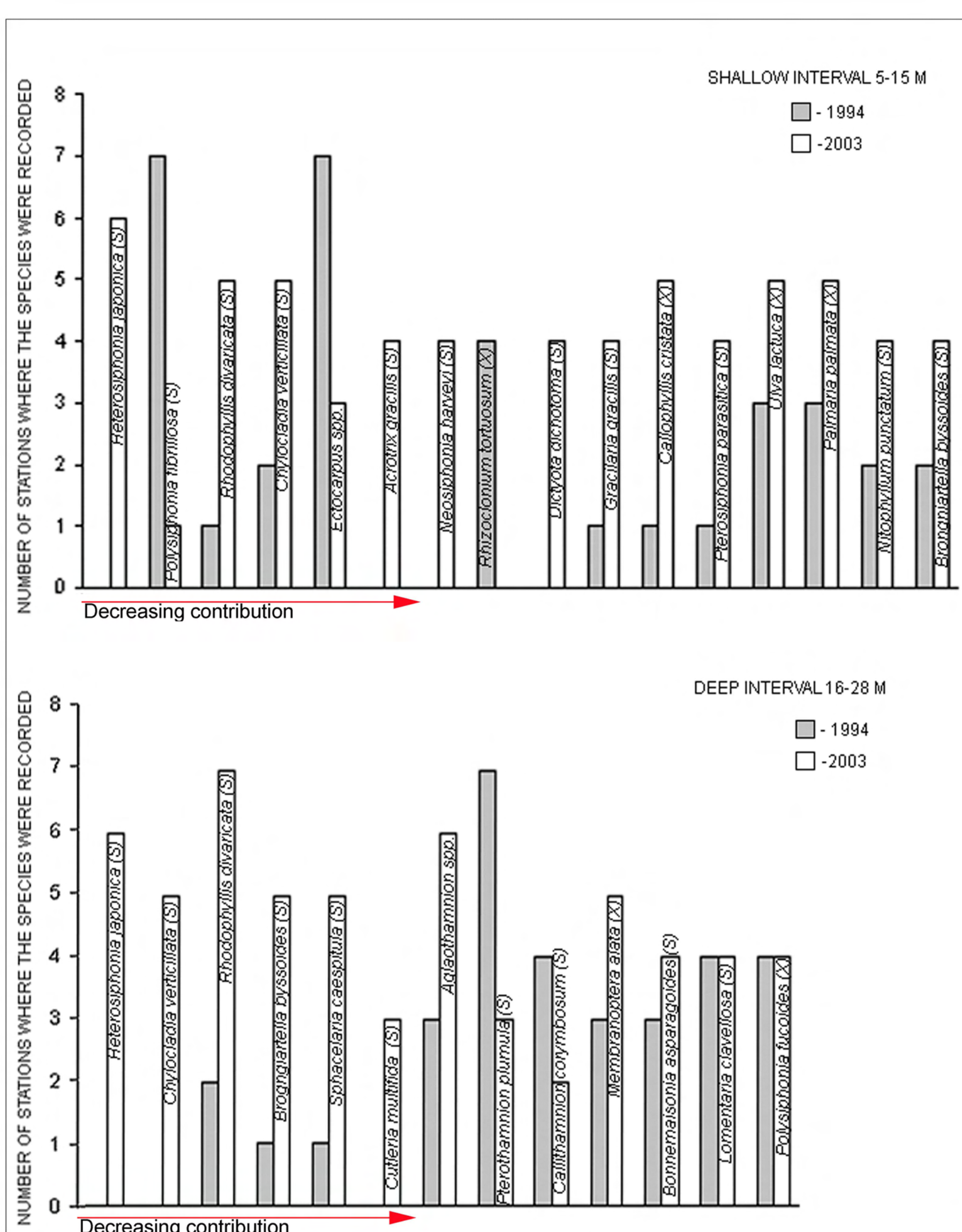


Figure 3. Number of localities where species contributing most to temporal differences were recorded. Only species contributing to a 30 % net dissimilarity are shown (Simpser analysis).

Picture legends

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