ResearchGate

See discussions, stats, and author profiles for this publication at: https://www.researchgate.net/publication/265785236

Effects of Temperature on Reproduction in an Atlantic Kelp, Laminaria longicruris, in the North Atlantic Ocean

Conference Paper · November 1992

DOI: 10.13140/2.1.3196.5445

CITATIONS
0

READS
26

3 authors, including:

Margaret (Peg) A.S. Van Patten
University of Connecticut
10 PUBLICATIONS **41** CITATIONS

SEE PROFILE

Charles Yarish
University of Connecticut
234 PUBLICATIONS **7,518** CITATIONS

SEE PROFILE

Some of the authors of this publication are also working on these related projects:

Lobster Mass Mortality in Long Island Sound View project

Seaweed aquaculture View project

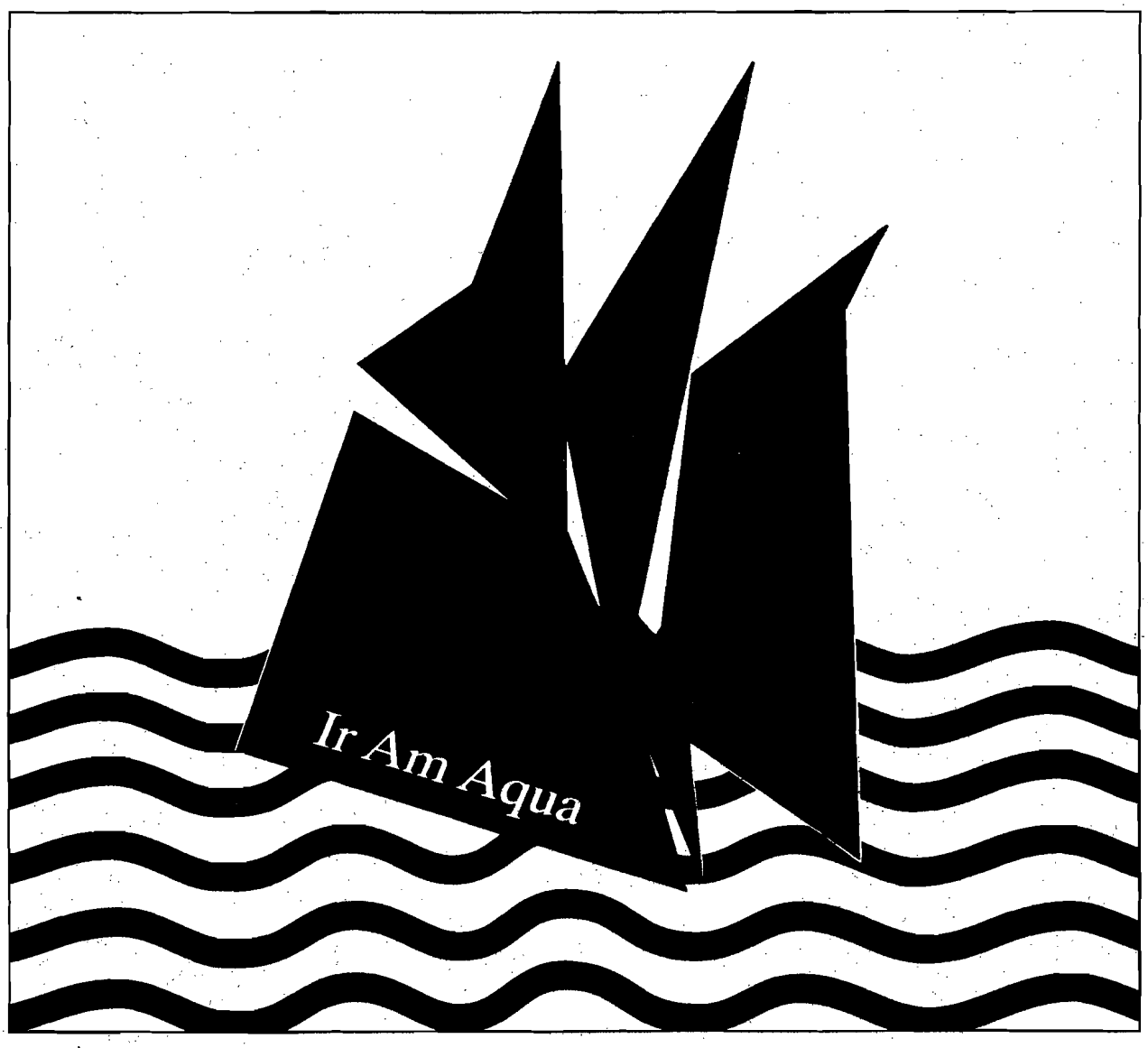
All content following this page was uploaded by Margaret (Peg) A.S. Van Patten on 18 September 2014.

The user has requested enhancement of the downloaded file.

Irish-American

TECHNICAL EXCHANGE

ON THE AQUACULTURE OF ABALONE • SEA URCHINS • LOBSTERS AND KELP



November 17-19, 1992 • Galway, Ireland • Martin Ryan Institute

Effects of Temperature on Reproduction in an Atlantic Kelp, *Laminaria longicruris*, in the North Atlantic Ocean

Margaret S. Van Patten[1], Connecticut Sea Grant, University of Connecticut, 1084 Shennecossett Rd., Groton, CT 06340-6097; Charles Yarish, University of Connecticut[2], 641 Scofieldtown Road, Stamford CT 06903; Iognáid ÓMuircheartaigh[3], Department of Mathematics, University College, Galway, Ireland.

Laminaria longicruris, a North Atlantic kelp with rapid growth rates and large biomass, is of both economic and ecological importance in subtidal coastal ecosystems, and is a key component of a variety of food webs. This species is known to suffer sporophyte deterioration at a temperature of 23°C, and summer temperature is known to constrain its southern limit of distribution. Our research shows that reproductive output in kelp is partially regulated by temperature as well. The role of temperature in determining the allocation of blade surface to meiospore production was quantified for populations of *Laminaria longicruris* at three study sites along a temperature gradient in the Northwestern Atlantic. Using a stratified random sampling technique, adult sporophytes were collected at sites in Long Island Sound (41° 17' N), Portsmouth, New Hampshire (43° 03'N) and Halifax, Nova Scotia (44° 38'N) in the spring of 1992. Photoperiod and insolation were roughly equivalent for all three sites. The ratio of sorus area (reproductive tissue) to blade (vegetative tissue). was determined by morphometric analysis and used as a measure of reproductive effort. Nonparametric statistical analysis revealed significant variation between sites with least reproductive effort occurring near the southern limit of the geographical distribution range (Figure 1). With increasing temperature and decreasing latitude, fewer resources were allocated to reproduction. A regression line fit to the data for the three latitudes shows a positive correlation between reproductive output and latitude, with an x-intercept occurring at 37.8° N, roughly equivalent to the known observed limit of the species (Figure 2). A second regression line fit to the data (Figure 3) shows that, theoretically, reproduction does not occur at spring temperatures above 12°C, corresponding roughly to a summer temperature of 23°. A global temperature warming of 1 to 2°C could eliminate the species from the Long Island Sound estuary by causing its geographical range to retreat northward.

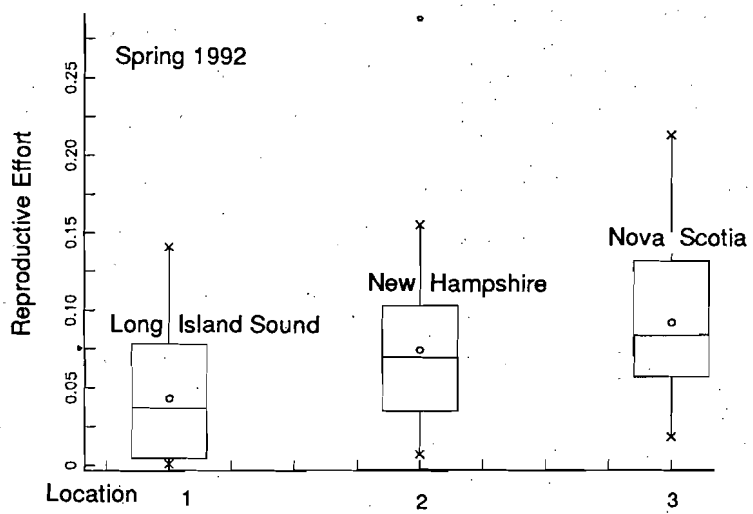


Figure 1. Box-and-whisker plots showing comparison of allocation of blade surface to reproduction in Laminaria longicruris *for spring 1992 samples at three latitudes in the Northwestern Atlantic Ocean. Circles represent medians; horizontal lines are means.*

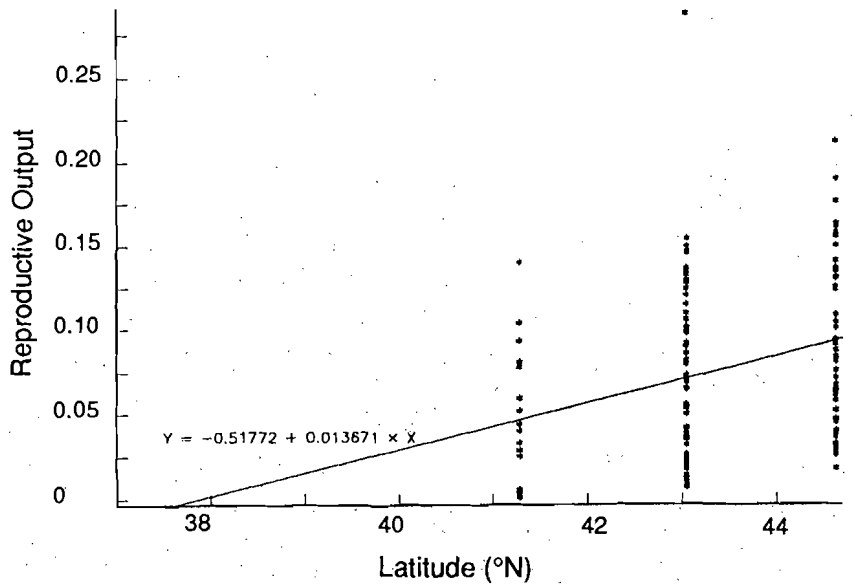


Figure 2. Regression of latitudes vs. ratio of sorus area to blade area for samples from three locations along a temperature gradient in the western Atlantic Ocean.

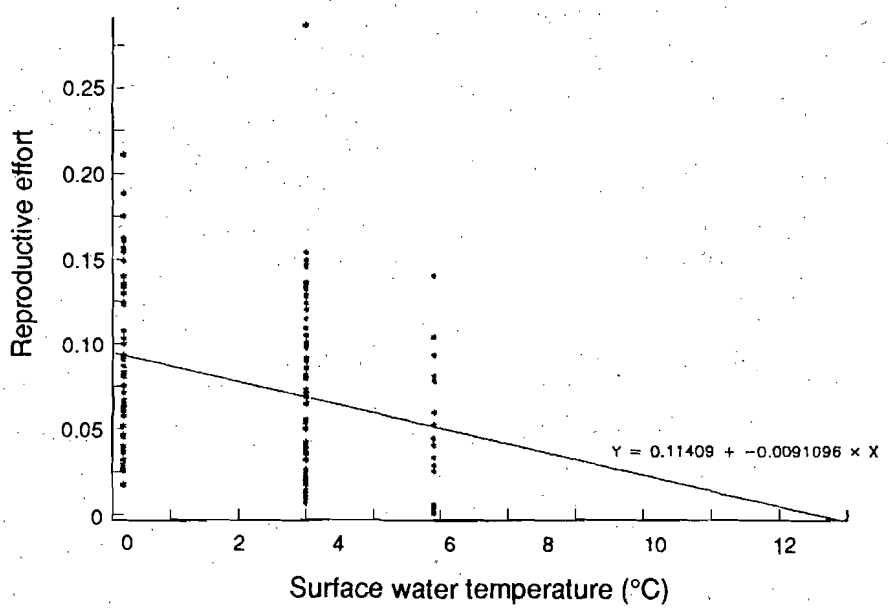


Figure 3. Regression of temperatures vs. reproductive output for L. longicruris *samples from three locations along a temperature gradient in the northwestern Atlantic Ocean.*