Comparison of monthly patterns of abundance and vertical distribution of *Pseudocalanus* spp. in five regions of Georges Bank during 1999 Broadscale surveys.

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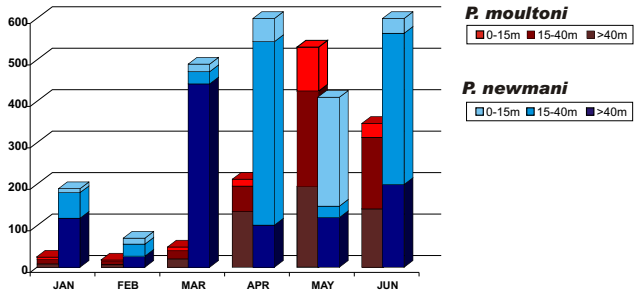
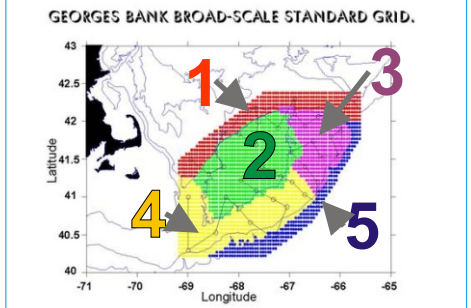
Abstract

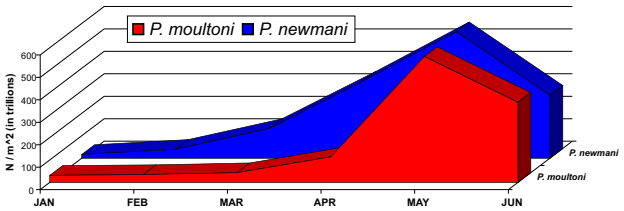
The cryptic copepods, *Pseudocalanus moultoni* and *P. newmani*, exhibit different month-to-month patterns of abundance and vertical distributions in the different regions of Georges Bank. Using a standard grid, concentrations of females for each species were mapped for 3 depth strata: surface (0 -15 m), sub-surface (15 - 40m), and deep (below 40m). Broadscale standard stations were assorted into five regions of Georges Bank: 1) northern flank, 2) Bank crest, 3) Northeast peak, 4) southern flank, and 5) Slope Water. During stratified conditions (April to June) on the Bank crest and southern flank, a significantly greater proportion of *P. newmani* are found in the top stratum, where they are subject to wind-driven transport. The greater preference of *P. moultoni* for deeper waters during these months may increase the likelihood of retention of these populations on Georges Bank.



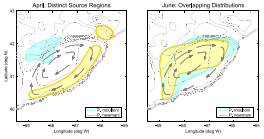
Bank-wide totals for 3 strata: *Pseudocalanus* spp. abundances for 3 strata were mapped to the standard grid and totaled across the Bank each month. Vertical distributions differed between the 2 species.



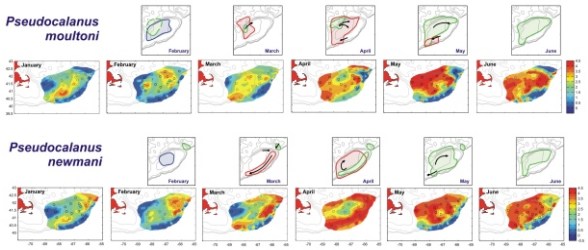
The grid spacing is 0.05 degrees in latitude and longitude. Also provided is the area represented by point. There are 2385 points in the grid.
1 = Northern Flank (Red), 2 = Crest (Green), 3 = Northeast Peak (Mauve), 4 = Southern Flank (Yellow), 5 = Slope Water (Blue)



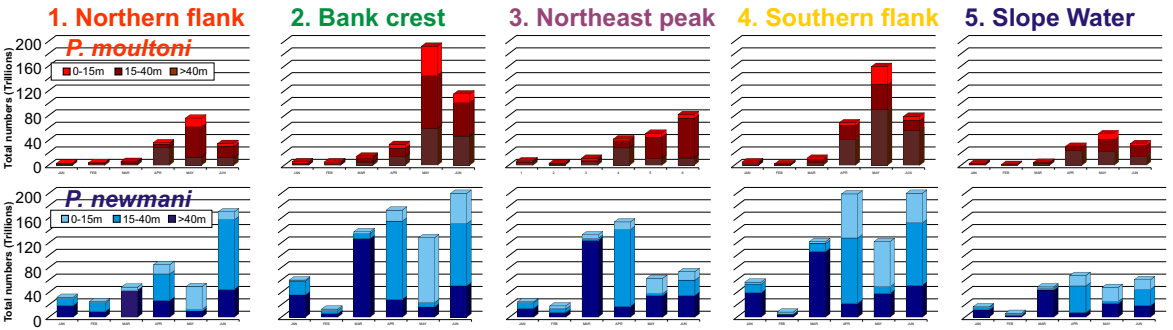
Total abundances of *Pseudocalanus* spp.: Bank-wide totals for each species were determined by mapping abundance data for 3 strata to a standard grid and inter/extrapolating abundances throughout the grid. Total abundances showed similar 1999 patterns for the 2 species, with an earlier increase for *P. newmani*.



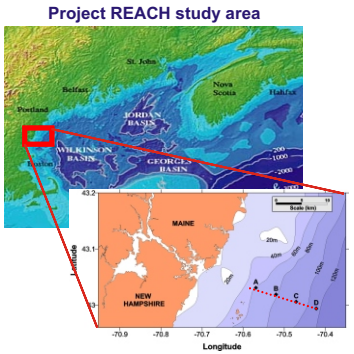
Conceptual model of *Pseudocalanus* spp. distributions: Species' distributions are distinct in April, with *P. moultoni* concentrated on the northern flank of Georges Bank, and *P. newmani* on the southern flank of Georges Bank and southern tip of Browns Bank. By June, species have overlapping distributions. (Figure: McGillicuddy & Bucklin, 2002)

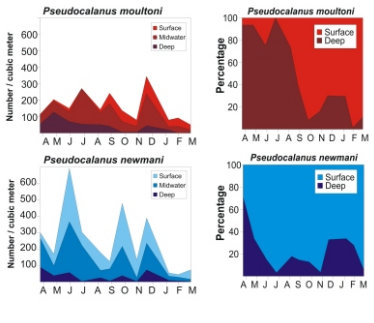


Broad-scale 1999 mapping for *Pseudocalanus* spp.: Objectively-analyzed maps for vertically-integrated 1999 distributions showed parallels with the 1997 cartoons (shown above each map). Source regions (red contours) were distinct; population centers (green) and biological sinks (blue) overlapped.



Regional comparison of *Pseudocalanus* spp. vertical distributions: Abundances in 3 strata (0-15m, 15-40m, >40m) were mapped to the standard grid and totaled for each region. Species' vertical distributions differed for most regions, with more *P. moultoni* in the lower stratum on the Bank crest and Northeast peak, and more *P. newmani* in the top stratum on the Southern flank. Small-scale studies are needed to determine relationships between water column structure and copepod vertical distributions.





***Pseudocalanus* spp. in the western Gulf of Maine:** In stratified waters, *P. moultoni* is concentrated at depth; *P. newmani* is more abundant at surface. In a fully-mixed water column, the two species show similar patterns of vertical distribution. Figures and data from Manning (2003), Manning & Bucklin (2004).

In conclusion: Although the 2 species are morphologically cryptic, they show distinct patterns of vertical distribution and abundance on both Georges Bank and the Gulf of Maine. Whether these differences result from distribution patterns, ecological preferences, and/or individual behaviors will require additional study.

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