Variation in the Viscosity of Lagoonal Waters

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INTRODUCTION

Relative viscosity is not a well understood property of the lagoonal waters of East Central Florida. Therefore, this parameter and its relations to some of the more usually measured factors (1, 2, 3) were investigated.

METHODS AND MATERIALS

Water samples were collected at various depths from predetermined stations in the Indian River portion of the lagoon, south of the Melbourne Causeway (S. R. 516).

Viscosity was determined by employing an Ostwald Viscosimeter suspended in a water-bath at 30^{o} C. Triple distilled water was used as the standard. Relative viscosity, as presented herein, is the ratio of the product of the specific gravity of the viscosimeter, to a similar product obtained for distilled water.

Salinity was measured potentiometrically using an Industrial Instruments Salinometer (Model RS-7B).

EXPERIMENTAL RESULTS

The area of present interest is that portion of the Indian River from Melbourne, Florida south to Sebastian Inlet as identified on Nautical Chart 845-SC (Coast & Geodetic Survey, U.S. Department of Commerce).

Figure 1 demonstrates an essentially inverse relationship between viscosity and salinity in these waters. Of particular interest are the samples collected at points around the Melbourne Causeway, Marker 24, and Marker 62 in which there occurs notably higher viscosities. These locations are in the general areas of Crane Creek, Goat Creek, and Sebastian Creek, respectively, where there is a significant influx of fresh water, thus a decrease in salinity.

Defant (4), and Sverdrup (5), state that viscosity gradually increases with increasing salinity in sea water. Figure 1, however, illustrates that the results presented herein do not support the salinity-viscosity relationship as it is usually stated. The data, instead, suggest that viscosity may not always be expressed as a function of salinity in lagoonal waters.

Figure 2 compares curves of the nitrate and phosphate levels obtained concurrently with those of the viscosity curve; there is no evident correlation between these parameters. On a geographic basis, however, there appears an increased viscosity in areas which receive waters from the several fresh water sources previously noted, and which also relate to agricultural runoff (Sebastian Creek), shell fish propagation (Marker 24), and a relatively large waste water treatment plant (Melbourne Causeway). Thus there is inferred a possible relationship between viscosity and the accumulation of oxidizable carbon compounds in these areas.

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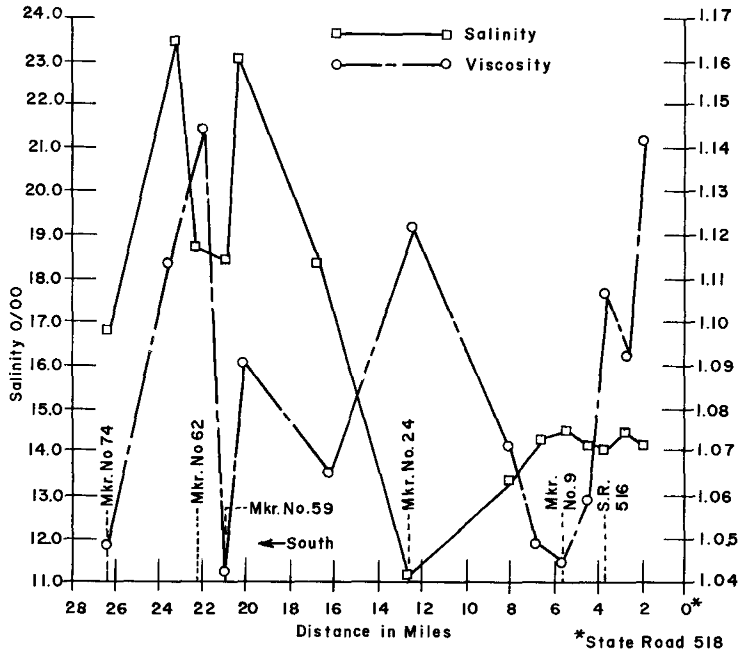

Figure 1. Changes in Relative Viscosity and Salinity in a Segm ent of the Indian River.

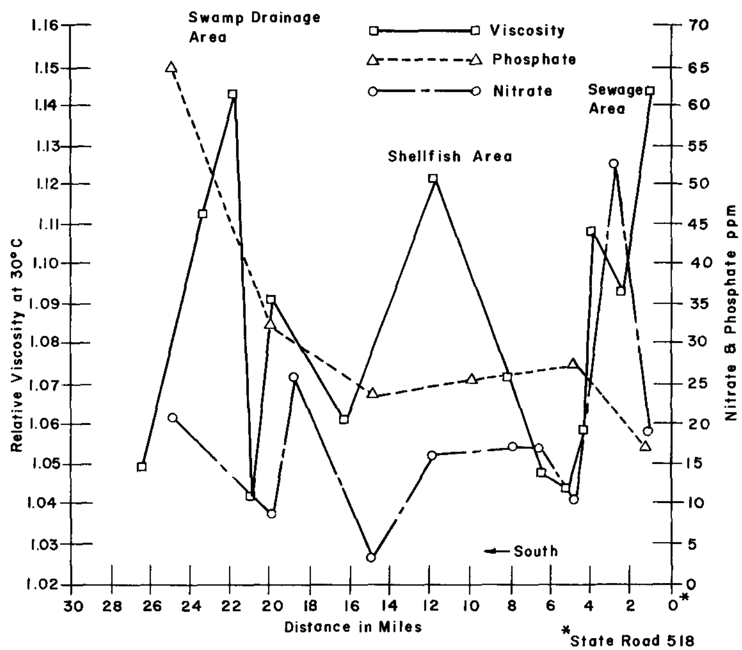

Figure 2. The Relationship of Nitrate and Phosphate levels to Relative Viscosity in a Segment of the Indian River.

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