1962

# Synoptic comparison of seston loads in the Rappahannock, York and James Rivers

Bernard C. Patten
*Virginia Institute of Marine Science*

# SYNOPTIC COMPARISON OF SESTON LOADS

# IN THE RAPPAHANNOCK, YORK AND JAMES RIVERS

— Summer, 1962 —



VIMS PLANKTOLOGY DEPARTMENT

SPECIAL COMMUNICATION NO. 1

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This report summarizes data obtained during summer, 1962 on suspended solids profiles at Hog House Bar (Rappahannock, directly out from Urbanna Creek to 30 ft depth), the productivity buoy (York, 30 ft) and Wreck Shoal (James, adjacent to buoy 12 at edge of channel, 30 ft). Water samples obtained the same day from the three stations at S, 2 (ft), 6, 10, 14, 18, 22, 26, B were analyzed for total, organic and inorganic seston by the gravimetric procedure described in VIMS Special Scientific Report No. 20 (1961). Temperature, chlorinity and extinction coefficient profiles were recorded, as well as S and B dissolved oxygen.

The data are insufficient to permit really meaningful comparisons between the three systems. In one case (Table 7, Exp. 4), an unsatisfactory result was obtained because of methodological difficulties. Bearing these limitations in mind, the James appeared generally warmer and more turbid than the York or Rappahannock, and had considerably higher bottom dissolved oxygen. Total solids were comparable at the times of sampling in all three rivers, suggesting, in view of the higher extinction coefficients for the James, that this system may have been higher in dissolved substances than the other two. Ratios of organic to inorganic suspensoids appeared highest in the Rappahannock and lowest in the James

Although the data are inadequate, a recommendation based on them would indicate oxygen and dissolved material to be worthy of further attention in respect to general productivity, both in the water column and in the benthos.

Bernard C. Patten
September 26, 1962

Table 1. Sampling times.

| | Exp. 1 (Jun 19) | Exp. 2 (Jul 3) | Exp. 3 (Jul 19) | Exp. 4 (Aug 2) |
|---|---|---|---|---|
| Rappahannock | 1000 | 1100 | 1030 | 1400 |
| York | 1630 | (Jul 10) | - | 1600 |
| James | 1400 | 1530 | 1430 | 0845 |

Table 2. Temperature (°C).

| Exp. No. | Depth (ft) | Rapp. | York | James |
|---|---|---|---|---|
| 1 | S | 25.62 | 26.55 | 25.90 |
| | 2 | 25.59 | 25.76 | 25.79 |
| | 6 | 24.43 | 24.64 | 25.65 |
| | 10 | 25.25 | 23.07 | 25.58 |
| | 14 | 25.19 | 23.01 | 25.33 |
| | 18 | 23.32 | 23.01 | 25.18 |
| | 22 | 22.68 | 23.01 | 24.95 |
| | 26 | 22.31 | --- | 24.98 |
| | B | 22.09 | 23.03 | 24.48 |
| 2 | S | 23.90 | --- | --- |
| | 2 | 24.03 | --- | --- |
| | 6 | 24.11 | --- | --- |
| | 10 | 24.28 | --- | --- |
| | 14 | 24.48 | --- | --- |
| | 18 | 24.41 | --- | --- |
| | 22 | 24.42 | --- | --- |
| | 26 | 24.34 | --- | --- |
| | B | 24.22 | --- | --- |
| 3 | S | 25.8 | --- | 27.5 |
| | 2 | 25.8 | --- | 27.5 |
| | 6 | 25.7 | --- | 27.5 |
| | 10 | 25.7 | --- | 27.4 |
| | 14 | 25.6 | --- | 27.2 |
| | 18 | 25.5 | --- | 27.2 |
| | 22 | 25.5 | --- | 27.2 |
| | 26 | 25.5 | --- | 27.1 |
| | B | 25.4 | --- | 27.0 |
| 4 | S | 26.8 | 27.0 | 27.5 |
| | 2 | 26.8 | 27.0 | 27.5 |
| | 6 | 26.8 | 26.8 | 27.5 |
| | 10 | 26.7 | 26.8 | 27.5 |
| | 14 | 26.5 | 26.5 | 27.4 |
| | 18 | 26.5 | 26.2 | 27.4 |
| | 22 | 26.5 | 26.0 | 27.2 |
| | 26 | 26.4 | --- | 27.0 |
| | B | 26.4 | 26.0 | 27.0 |

Table 3. Chlorinity (‰).

| Exp. No. | Depth (ft) | Rapp. | York | James |
|---|---|---|---|---|
| 1 | S | 6.49 | 9.22 | 4.42 |
| | 2 | 6.51 | 9.42 | 4.54 |
| | 6 | 6.50 | 10.21 | 4.91 |
| | 10 | 6.51 | 10.47 | 5.01 |
| | 14 | 5.61 | 10.71 | 6.51 |
| | 18 | 7.61 | 10.72 | 5.59 |
| | 22 | 6.81 | 10.76 | 5.89 |
| | 26 | 8.79 | --- | 6.13 |
| | B | 9.27 | 10.74 | 7.11 |
| 2 | S | 7.4 | --- | 5.1 |
| | 2 | 7.4 | --- | 5.1 |
| | 6 | 7.4 | --- | 5.1 |
| | 10 | 7.5 | --- | 5.4 |
| | 14 | 7.6 | --- | 5.4 |
| | 18 | 7.7 | --- | 5.3 |
| | 22 | 7.8 | --- | 6.2 |
| | 26 | 8.0 | --- | 7.1 |
| | B | 6.7 | --- | 7.3 |
| 3 | S | 7.0 | --- | 5.2 |
| | 2 | 7.0 | --- | 5.3 |
| | 6 | 7.2 | --- | 5.6 |
| | 10 | 7.3 | --- | 5.4 |
| | 14 | 7.2 | --- | 6.0 |
| | 18 | 7.6 | --- | 6.2 |
| | 22 | 7.9 | --- | 6.6 |
| | 26 | 8.0 | --- | --- |
| | B | 8.0 | --- | 6.8 |
| 4 | S | 4.60 | 9.22 | 6.76 |
| | 2 | 5.91 | 9.54 | 6.91 |
| | 6 | 5.61 | 9.57 | 8.27 |
| | 10 | 5.46 | 9.72 | 8.46 |
| | 14 | 5.27 | 10.23 | 8.69 |
| | 18 | 6.01 | 10.46 | 8.91 |
| | 22 | 5.31 | 10.78 | 9.52 |
| | 26 | 5.61 | 10.84 | 10.02 |
| | B | 3.41 | 10.79 | 10.03 |

Table 4. Extinction Coefficient ($m^{-1}$).

| Exp. No. | Depth (ft) | Rapp. | York | James |
|---|---|---|---|---|
| 1 | S | 0.53 | 1.05 | 0.78 |
| | 2 | 0.68 | 0.58 | 1.02 |
| | 6 | 0.63 | 0.86 | 1.02 |
| | 10 | 0.63 | 0.61 | 1.02 |
| | 14 | 1.05 | 0.61 | 0.63 |
| | 18 | 0.61 | 0.71 | 0.98 |
| | 22 | 0.61 | 0.71 | 1.13 |
| | 26 | 0.41 | -- | 1.17 |
| | B | 0.39 | 1.01 | 2.68 |
| 2 | S | 1.07 | -- | 1.07 |
| | 2 | 0.95 | -- | 1.36 |
| | 6 | 0.77 | -- | 1.46 |
| | 10 | 1.10 | -- | 1.16 |
| | 14 | 1.09 | -- | 1.26 |
| | 18 | 0.86 | -- | 1.26 |
| | 22 | 0.99 | -- | 1.53 |
| | 26 | 0.63 | -- | 2.32 |
| | B | 3.80 | -- | 1.86 |
| 3 | S | 0.80 | -- | 1.10 |
| | 2 | 0.80 | -- | 1.09 |
| | 6 | 0.83 | -- | 0.92 |
| | 10 | 0.84 | -- | 0.98 |
| | 14 | 0.83 | -- | 1.01 |
| | 18 | 0.87 | -- | 1.15 |
| | 22 | 0.91 | -- | 1.15 |
| | 26 | 0.92 | -- | 1.24 |
| | B | 0.92 | -- | 2.88 |
| 4 | S | 0.53 | 1.06 | 0.78 |
| | 2 | 0.68 | 1.09 | 0.79 |
| | 6 | 0.64 | 1.10 | 0.95 |
| | 10 | 0.63 | 1.12 | 0.97 |
| | 14 | 0.60 | 1.17 | 1.00 |
| | 18 | 0.69 | 1.20 | 1.02 |
| | 22 | 0.61 | 1.24 | 1.09 |
| | 26 | 0.64 | 1.24 | 1.15 |
| | B | 0.39 | 1.24 | 1.15 |

Table 5. Dissolved oxygen (mg $l^{-1}$).

| Exp. No. | Rapp. | | York | | James | |
|---|---|---|---|---|---|---|
| | S | B | S | B | S | B |
| 1 | - | - | - | - | - | - |
| 2 | - | - | - | - | - | - |
| 3 | 7.70 | 2.32 | - | - | 7.38 | 6.90 |
| 4 | 6.27 | 2.13 | 6.30 | 4.68 | 6.30 | 5.90 |

Table 6. Suspended Solids, Total (mg $l^{-1}$).

| Exp. No. | Depth (ft) | Rapp. | York | James |
|---|---|---|---|---|
| 1 | S | 9.8 | 8.4 | 5.4 |
| | 2 | 10.2 | 10.6 | 5.8 |
| | 6 | 9.6 | 11.2 | 6.8 |
| | 10 | 7.6 | 12.8 | 3.6 |
| | 14 | 9.0 | 15.6 | 4.4 |
| | 18 | 10.2 | 16.8 | 3.2 |
| | 22 | 11.6 | 15.0 | 4.8 |
| | 26 | 11.2 | -- | 6.4 |
| | B | 25.8 | 20.6 | 8.8 |
| 2 | S | 6.0 | 4.4 | 7.0 |
| | 2 | 12.0 | 10.0 | 9.8 |
| | 6 | 4.8 | 5.0 | 11.0 |
| | 10 | 2.6 | 7.0 | 8.0 |
| | 14 | 3.0 | 5.0 | 8.0 |
| | 18 | 7.6 | 6.0 | 11.0 |
| | 22 | 5.8 | 12.2 | 11.2 |
| | 26 | 8.6 | -- | 18.0 |
| | B | 31.4 | 66.2 | 20.4 |
| 3 | S | 1.4 | -- | 3.8 |
| | 2 | 1.2 | -- | 1.8 |
| | 6 | 1.2 | -- | 1.0 |
| | 10 | 0.8 | -- | 2.0 |
| | 14 | 1.6 | -- | 2.0 |
| | 18 | 4.4 | -- | 1.6 |
| | 22 | 3.0 | -- | 2.0 |
| | 26 | 6.4 | -- | 2.4 |
| | B | 2.4 | -- | 8.6 |
| 4 | S | 7.6 | 4.4 | 5.8 |
| | 2 | 10.0 | 3.4 | 8.4 |
| | 6 | 7.6 | 7.2 | 5.0 |
| | 10 | 5.2 | 5.6 | 6.6 |
| | 14 | 4.8 | 5.8 | (-12.8) |
| | 18 | 7.6 | 14.4 | 2.8 |
| | 22 | 1.4 | 29.6 | 5.8 |
| | 26 | 16.6 | -- | 5.8 |
| | B | 25.4 | 47.0 | 5.2 |

Table 7. Suspended solids, organic and inorganic (mg $l^{-1}$).

| Exp. No. | Depth (ft) | Rapp. | | York | | James | |
|---|---|---|---|---|---|---|---|
| | | I | O | I | O | I | O |
| 1 | S | 2.0 | 7.8 | 0.4 | 7.8 | 2.4 | 3.0 |
| | 2 | 2.0 | 8.2 | 1.6 | 9.0 | 2.0 | 3.8 |
| | 6 | 2.0 | 7.6 | 2.8 | 8.4 | 3.6 | 3.2 |
| | 10 | 0.8 | 6.8 | 5.0 | 7.8 | 1.6 | 2.0 |
| | 14 | 1.0 | 8.0 | 7.0 | 8.6 | 2.4 | 2.0 |
| | 18 | 2.2 | 8.0 | 7.6 | 9.2 | 2.0 | 1.2 |
| | 22 | 4.2 | 7.4 | 6.6 | 8.4 | 2.8 | 2.0 |
| | 26 | 3.8 | 7.4 | -- | -- | 3.6 | 2.8 |
| | B | 15.8 | 10.0 | 14.2 | 6.4 | 5.2 | 3.6 |
| 2 | S | 1.0 | 5.0 | 1.3 | 3.1 | 5.6 | 1.4 |
| | 2 | 5.2 | 6.8 | 3.2 | 6.8 | 4.0 | 3.8 |
| | 6 | 1.2 | 3.6 | 1.0 | 4.0 | 1.2 | 9.8 |
| | 10 | 1.0 | 1.2 | 4.2 | 2.8 | 2.8 | 1.2 |
| | 14 | 1.2 | 1.8 | 1.0 | 4.0 | 7.4 | 0.6 |
| | 18 | 2.8 | 4.8 | 2.2 | 3.8 | 7.0 | 4.0 |
| | 22 | 1.4 | 4.4 | 7.8 | 4.4 | 6.8 | 4.4 |
| | 26 | 3.4 | 5.2 | -- | -- | 14.0 | 4.0 |
| | B | 26.0 | 5.4 | 58.8 | 7.4 | 18.6 | 1.8 |
| 3 | S | 0.8 | 0.6 | -- | -- | 3.4 | 0.4 |
| | 2 | 0.8 | 0.4 | -- | -- | 1.4 | 0.4 |
| | 6 | 1.0 | 0.2 | -- | -- | 0.8 | 0.2 |
| | 10 | 0.6 | 0.2 | -- | -- | 1.6 | 0.4 |
| | 14 | 1.4 | 0.2 | -- | -- | 1.8 | 0.2 |
| | 18 | 4.0 | 0.4 | -- | -- | 1.4 | 0.2 |
| | 22 | 2.8 | 0.2 | -- | -- | 1.4 | 0.6 |
| | 26 | 6.0 | 0.4 | -- | -- | 2.0 | 0.4 |
| | B | 2.2 | 0.2 | -- | -- | 7.6 | 1.0 |
| 4 | S | (-0.6) | 8.2 | (-3.4) | 7.8 | 1.4 | 4.4 |
| | 2 | 3.2 | 6.8 | 1.8 | 1.6 | 4.2 | 4.2 |
| | 6 | 1.0 | 6.6 | 2.0 | 5.2 | 1.2 | 3.8 |
| | 10 | (-1.0) | 6.2 | 3.6 | 2.0 | 0.0 | 6.6 |
| | 14 | (-0.2) | 5.0 | 4.6 | 1.2 | (-0.2) | (-12.6) |
| | 18 | 2.2 | 5.4 | 11.4 | 3.0 | (-1.4) | 4.2 |
| | 22 | 2.8 | (-1.4) | 27.4 | 2.2 | 0.0 | 5.8 |
| | 26 | 2.8 | 13.8 | --- | -- | (-1.6) | 7.4 |
| | B | 17.8 | 7.6 | 19.8 | 27.2 | 1.4 | 3.8 |

Table 8. Suspended solids, organic/inorganic ratios.

| Exp. No. | Depth (ft) | Rapp. | York | James |
|---|---|---|---|---|
| 1 | S | 3.90 | 1.95 | 1.25 |
| | 2 | 4.10 | 5.62 | 1.90 |
| | 6 | 3.80 | 3.00 | 0.89 |
| | 10 | 0.85 | 1.56 | 1.25 |
| | 14 | 8.00 | 1.23 | 0.83 |
| | 18 | 3.64 | 1.21 | 0.60 |
| | 22 | 1.76 | 1.27 | 0.71 |
| | 26 | 1.95 | --- | 0.78 |
| | B | 0.63 | 0.45 | 0.69 |
| 2 | S | 5.00 | 2.38 | 0.25 |
| | 2 | 1.31 | 2.12 | 0.95 |
| | 6 | 3.00 | 4.00 | 8.17 |
| | 10 | 1.20 | 0.67 | 0.43 |
| | 14 | 1.50 | 4.00 | 0.08 |
| | 18 | 1.71 | 1.73 | 0.57 |
| | 22 | 3.14 | 0.56 | 0.65 |
| | 26 | 1.53 | --- | 0.28 |
| | B | 0.21 | 0.12 | 0.10 |
| 3 | S | 0.75 | --- | 0.11 |
| | 2 | 0.50 | --- | 0.28 |
| | 6 | 0.20 | --- | 0.11 |
| | 10 | 0.30 | --- | 0.25 |
| | 14 | 0.14 | --- | 0.11 |
| | 18 | 0.10 | --- | 0.14 |
| | 22 | 0.07 | --- | 0.43 |
| | 26 | 0.07 | --- | 0.20 |
| | B | 0.09 | --- | 0.13 |
| 4 | S | (-13.67) | (-2.29) | 3.14 |
| | 2 | 2.12 | 0.89 | 1.00 |
| | 6 | 6.60 | 2.60 | 3.17 |
| | 10 | (-6.20) | 0.56 | --- |
| | 14 | (-25.00) | 0.26 | 6.30 |
| | 18 | 2.45 | 0.26 | (-3.00) |
| | 22 | (-0.50) | 0.08 | --- |
| | 26 | 4.93 | --- | (-4.62) |
| | B | 0.43 | 1.37 | 2.71 |