SOME PHYSICAL AND CHEMICAL PROPERTIES OF THE
CELL SAP OF HALICYSTIS OVALIS (LYNGB.) ARESCH.

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(From The Hopkins Marine Station, Pacific Grove)

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During the summer of 1929, at The Hopkins Marine Station, at
Pacific Grove, California, the following brief study was made of some
of the physical and chemical properties of the cell sap of Halicystis
ovalis (Lyngb.) Aresch. This was done in connection with a more
extensive study by the writer on its morphology and reproduction
which has, in part, been already reported by Dr. G. M. Smith (1930).

The specific gravity of the sap was determined by means of a small pyknometer
drawn to a fine capillary for insertion through the cell wall of the plant. The
latter was carefully cleaned and dried at the point of insertion and the sap of only
one plant was used in each determination.

Determination of cell flotation was possible because occasionally plants could be
severed from the Lithothamnion on which they grow without rupturing the cell
wall at the point of attachment and without loss of turgor. These isolated cells
sink readily in sea water in contrast to those of the Bermuda species (Blinks, 1927;
1929–30) which float. By varying the concentration of the solution in which they
were immersed, a solution was obtained in which the plants were just suspended.
It is interesting in this connection that the plant is able to withstand slight
changes in the salinity of the water (0.46 to 0.55 molar) without apparent ill
effects.

Barger’s method was employed in determining vapor tension. This was by
means of a capillary tube in which a small drop of the sap was placed between
two similar drops of NaCl solution of a known concentration, the ends of the tube
being sealed with oil. A concentration of the salt solution was finally found with
which there was no change in the size of the drop of sap observable under a low
power magnification with the use of an ocular micrometer. The method gives
only approximate results.

In chloride determinations a small pyknometer was again employed to get a
known volume of the sap from a single plant. Volhard’s method of determination
was used, adding excess AgNO₃ and titrating the excess with KCNS, using
Fe₂(SO₄)₃(NH₄)₂SO₄ as an indicator.
Sulfate was determined as $\text{BaSO}_4$ by means of a small weighing bottle with a fused glass filter after precipitation with excess $\text{BaCl}_2$.

The pH was determined with brom cresol purple and brom cresol green.

The chief results are as follows:

Specific gravity (25°C.)

- *Halicystis* cell sap (average of four samples) .................. 1.0257
- Sea water at Pacific Grove (average of three samples) .......... 1.0258

Flotation (expressed as specific gravity) of total cell

- Average of three vegetative plants .................. 1.0265
- Average of two plants in reproductive stages ................. 1.0275

Vapor tension about equal to that of 0.60 m $\text{NaCl}$ and practically identical with that of sea water at Pacific Grove ($= 0.606^\circ$).

Chloride content

- Average of three vegetative plants ....... 1.926 per cent or 0.543 m
- One plant recovering from a reproductive period .................. 1.933 per cent or 0.545 m
- Average of six plants in reproductive stages ........ 1.978 per cent or 0.558 m
- Sea water at Pacific Grove (average of three samples) ........ 1.851 per cent or 0.523 m

Sulfate content

- *Halicystis* sap (average of two samples of several plants each) .......... 0.013 per cent or 0.00135 m
- Sea water at Pacific Grove (one sample) .................. 0.279 per cent or 0.029 m

pH

- *Halicystis* sap ................................................ 5.4
- Sea water at Pacific Grove .................................... 8.15

Index of refraction

The $N_d$ based on a number of samples ranged from 1.3384 to 1.3387 at 25°C, with little variation among different plants and practically identical with that of sea water at Pacific Grove throughout the range of temperatures studied (2.5-34.7°C.).

It may be added that Brooks (1930) has reported the $K \div Na$ ratio of the sap to be 1.5.

* This study was made under the direction of Dr. L. B. Baas-Becking at The Hopkins Marine Station. The figures marked with an asterisk were supplied by him.
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LITERATURE CITED


Smith, G. M., 1930, Observations on some siphonaceous green algae of the Monterey Peninsula, Contributions to marine biology, Stanford University, Stanford University Press, 222.