



Volume 1 of 4
Sea Grant Bayside

Diluting Water Quality Samples for Soft Crab Shedding

John Hochheimer
Maryland Sea Grant Extension Program

INTRODUCTION

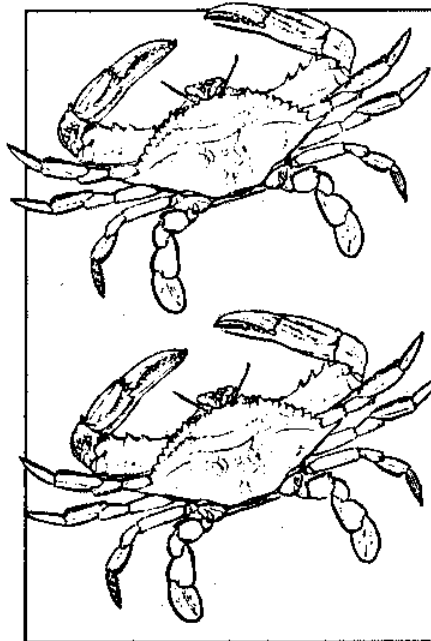
Careful monitoring of water quality is essential for successful closed system crab shedding. Typically the crab shedder monitors six water quality properties—dissolved oxygen, temperature, salinity, pH, ammonia and nitrite (see “Water Quality in Soft Crab Shedding,” UM-SG-MAP-88-01, for discussion of these parameters and how to measure them).

Often the concentration of the water quality parameter you would like to measure is too high to fit within the range of values your test kit can measure. When this occurs you must dilute your sample and retest it. You then multiply your test result by the appropriate factor to give you the correct value of the concentration in your original, undiluted sample.

Here I give instructions for how to dilute samples for measuring with test kits, and how to convert the test value from the diluted sample to the correct value for the undiluted sample.

GENERAL INSTRUCTIONS

Always use clean glassware that has been rinsed with distilled water when making dilutions. For accurate results, be sure to use the appropriate graduated cylinder, pipette, or syringe when drawing your samples. For



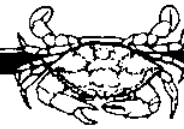
example, you wouldn't use a 10 milliliter (ml) graduated cylinder to measure out 0.1 ml; using a 1 ml pipette or syringe would give you far more accurate results. As your first dilution use a power of ten, 1 in 10 for example, to ease calculation. Be careful not to contaminate samples or dilutions when measuring water quantities—if in doubt, rinse equipment and start over.

Treat all chemicals in test kits as if they were toxic to both crabs and humans. Never put test chemicals in

shedding system water or use system water to rinse out test tubes. Be sure to keep all chemicals out of reach of children or pets. And always read and follow all instructions carefully.

DILUTION PROCEDURE

1. Clean and rinse all glassware with distilled water.
2. Collect a sample of water to be tested.
3. Start with a 1 part in 10 dilution (1/10) to find the appropriate range.
4. Refer to the relevant dilution table to find the amount of distilled water to add for a given sample size.
5. Measure a sample of system water and pour into kit test-tube.
6. Measure the proper amount of distilled water and pour into test-tube.
7. Follow the kit manufacturer's instructions to analyze the sample.
8. If color is in range, read corresponding concentration.
9. Multiply the concentration value found in step 8 by the appropriate multiplication factor from the table.
10. For two tube tests in comparators, follow steps five and six for each tube.



11. If the sample is still out of range, try a one part in 100 parts dilution and repeat steps one through nine omitting step three.
12. If the sample is too dilute after 1/10, try a smaller dilution (i.e. 1/2, 1/4, or 1/5).

Note:

A 1 part in 10 dilution is variously expressed as:
 1/10 dilution,
 a part in 10 dilution, or
 1:9 dilution.

AN EXAMPLE

You have a test kit that measures ammonia in the range of 0 to 8 parts per million (ppm). The kit requires a 4.0 ml sample. When testing your shedding system, you find that the initial sample color is darker than the color corresponding to 8 ppm. To find the ammonia concentration in your system you dilute your sample and retest.

Procedure:

1. Properly dispose of the previous sample and clean glassware. Rinse with distilled water.
2. Collect a new system water sample.
3. Try a 1 part in 10 dilution.
4. Go to the dilution table for total sample size of 4.0 ml. From the table find that:
 - amount of system water you draw = 0.4 ml
 - amount of distilled water you will need = 3.6 ml
 - multiplication factor = 10
5. Carefully measure 0.4 ml of the system water into a kit test-tube.
6. Add 3.6 ml of distilled water. The water should be at the proper fill line on the test-tube. Mix by stoppering and inverting several times.
7. Follow kit instructions for analysis.

DILUTION TABLES

Sample size: 1 ml

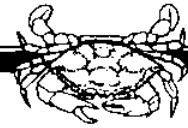
Dilution rate	Ml. of system water drawn	Ml. of distilled water added	Multiplication factor
1	1	0	1
1/2	0.5	0.5	2
1/5	0.2	0.8	5
1/10	0.1	0.9	10
1/50	0.02	0.98	50
1/100	0.01	0.99	100
1/500	0.002	0.998	500

Sample size: 2 ml

Dilution rate	Ml. of system water drawn	Ml. of distilled water added	Multiplication factor
1	2	0	1
1/2	1	1	2
1/4	0.5	1.5	4
1/10	0.2	1.8	10
1/40	0.05	1.95	40
1/100	0.02	1.98	100
1/400	0.005	1.995	400
1/1000	0.002	1.998	1000

Sample size: 3 ml

Dilution rate	Ml. of system water drawn	Ml. of distilled water added	Multiplication factor
1	3	0	1
1/2	1.5	1.5	2
1/3	1	2	3
1/10	0.3	2.7	10
1/30	0.1	2.9	30
1/100	0.03	2.98	100
1/300	0.01	2.99	300
1/1000	0.003	2.997	1000



DILUTION TABLES continued

Sample size: 4 ml

Dilution rate	Ml. of system water drawn	Ml. of distilled water added	Multiplication factor
1	4	0	1
1/2	2	2	2
1/4	1	3	4
1/10	0.4	3.6	10
1/40	0.1	3.9	40
1/100	0.04	3.96	100
1/400	0.01	3.99	400
1/1000	0.004	3.996	1000

Sample size: 5 ml

Dilution rate	Ml. of system water drawn	Ml. of distilled water added	Multiplication factor
1	5	0	1
1/2	2.5	2.5	2
1/5	1	4	5
1/10	0.5	4.5	10
1/50	0.1	4.9	50
1/100	0.05	4.95	100
1/500	0.01	4.99	500
1/1000	0.005	4.995	1000

8. If color is in range, read the corresponding concentration.
9. Multiply the test kit concentration by 10 to get the final concentration.

For example, if the kit test gives a value of 1 ppm for ammonia concentration, multiply 1 by 10, to yield a value of 10 ppm for the ammonia concentration in your system water.

If the color is still not within range, start over with a 1 in 100 dilution. If the color was too light to be read by the test kit, retest using a 1/2 or 1/5 dilution.

SUMMARY

When a water quality parameter test value exceeds the range of your test kit, dilute the sample and retest, then multiply the test value by the appropriate factor to find the test value corresponding to your original sample.

If the test value of the diluted sample is still outside the range measurable by the test kit, dilute the original sample by the next higher power of ten and retest.

When diluting samples use clean glassware that has been rinsed with distilled water. Dilute in powers of

ten for ease of calculation. Always assume the chemicals from the test kits are toxic—don't rinse glassware that has held chemicals in the crab shedding system water, and keep the kit beyond the reach of children.

FOR FURTHER INFORMATION

Maryland Sea Grant Extension
University of Maryland
Cooperative Extension Service
Talbot County Office
P.O. Box 519
Easton, Maryland 21601
Telephone: 301-822-1166

or

Maryland Sea Grant Extension
University of Maryland
Horn Point Environmental Lab
P.O. Box 775
Cambridge, Maryland 21613
Telephone: 301-228-8200

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