

Langerhans Lab Protocols

NC STATE UNIVERSITY

Fish Tank Water Chemistry

The quote below was copied from an e-mail by Gabriel McKeon (DVM, DACLAM, University Attending Veterinarian, NCSU, LAR) to Brian Langerhans (PI), Erik Archer (current Lab Manager), Kay Coole, Judith Lassiter Schledorn, and Paula DeLong on 1-31-14:

“Please ensure that water quality results are recorded and available for review. The frequency will largely depend upon performance of the fish, but a standard frequency should be established in your SOP. I think by and large, a weekly test is sufficient for most colonies of fish in a stable environment and subsequent water changes as needed.”

Refer to the table below for information and instructions for testing each water chemistry component. As the directions above suggest, testing and record keeping is required for these facilities to conform to IACUC (Institutional Animal Care and Use Committee) and AAALAC (Association for Assessment and Accreditation of Laboratory Animal Care) regulations. Currently, testing is performed: 1) on one random 5-20 gallon tank in BRF 221; 2) the re-circulating tank system in BRF 221; and 3) on one random 5-20 gallon tank in BRF 223 every other week. Record test results on C:\Users\LangerhansLab\Dropbox\FishCare\TankMaintenance_ChemLog.xlsx. Testing frequency will likely vary slightly with changing number of fish/tanks; review the proper procedure with Dr. Langerhans if you are unclear about any of these requirements or details. BRF 223 rack system water quality is monitored, recorded, and uploaded to the lab server automatically. This information can be accessed at C:\Users\LangerhansLab\Dropbox\BRFRACK223.

Water Chemistry Testing Information for Tanks Inhabited by Blue Hole Fish and NC Creek Chub

Component	Target Ranges for blue hole fish (e.g. <i>Gambusia</i>)	Target Ranges for NC creek chub (i.e. <i>Semotilus atromaculatus</i>)	To Adjust
pH Measure by using the red and black pH/temp meter. Instruction manual in binder.	7.5 – 8.5	7.8 - 8.0	Increase by adding pH Up. Decrease by adding pH Minus or baking soda. Stabilize by water change.
Water temp Measure by using the red and black pH/temp meter. Instruction manual in binder.	75 – 78°F (23.9-25.6°C)	75°F (23.9°C)	Change heater setting.
Salinity (ppt) Measure by using the YSI instrument in the black case on the shelf in BRF 221.	1.0 ppt	0.0-0.5 ppt	Increase by adding Instant Ocean. Decrease by water change.
Dissolved Oxygen (%) Measure by using the YSI instrument in the black case on the shelf in BRF 221.	See directions for DO meter calibration and saturation values on next page.	See directions for DO meter calibration and saturation values on next page.	Change air stone flow and/or remove any unwanted organisms from the tank.
Ammonia (ppm) Measure by using test solutions (see instruction booklets).	Near 0 in established tanks.	Near 0 in established tanks.	Decrease by water change and/or adding Ammo Lock.
Nitrite (ppm) Measure by using test solutions (see instruction booklets).	Near 0 in established tanks.	Near 0 in established tanks.	Decrease by water change.
Nitrate (ppm) Measure by using test solutions (see instruction booklets).	< 40 ppm	< 40 ppm	Decrease by water change.

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Hanna pH/Temp meter (HI 98127 98128) instruction manual excerpt:

http://www.hannainst.com/manuals/IST98127_04_13.pdf

For better accuracy, frequent calibration of the instrument is recommended. In addition, the instrument must be recalibrated whenever: 1) the pH electrode is replaced; 2) after testing aggressive chemicals; 3) where high accuracy is required; and 4) at least once a month.

Calibration procedure:

From normal measuring mode, press and hold the MODE button until "OFF" on the secondary LCD is replaced by "CAL". Release the button. The LCD enters the calibration mode displaying "pH 7.01 USE" (or "pH 6.86 USE" if the NIST buffer set was selected). After 1 second the meter activates the automatic buffer recognition feature. If a valid buffer is detected then its value is shown on the primary display and "REC" appears on the secondary LCD. If no valid buffer is detected, the meter keeps the "USE" indication active for 12 seconds, and then it replaces it with "WRNG", indicating the sample being measured is not a valid buffer.

For a single-point calibration with buffers pH 4.01, 9.18 or 10.01, the meter automatically accepts the calibration when the reading is stable; the meter displays the accepted buffer, with the message "OK 1". After 1 second the meter automatically returns to the normal measuring mode. If a single-point calibration with buffer pH 7.01 (or pH 6.86) is desired, then after the calibration point has been accepted the MODE button must be pressed in order to return to normal mode. After the button is pressed, the meter shows "7.01" (or "6.86") "OK 1" and, after 1 second, it automatically returns to the normal measuring mode.

Note: It is always recommended to carry out a two-point calibration for better accuracy.

For a two-point calibration, place the electrode in pH 7.01 (or pH 6.86) buffer. After the first calibration point has been accepted, the "pH 4.01 USE" message appears. The message is held for 12 seconds, unless a valid buffer is recognized. If no valid buffer is recognized, then the "WRNG" message is shown. If a valid buffer (pH 4.01, pH 10.01, or pH 9.18) is detected, then the meter completes the calibration procedure. When the buffer is accepted, the LCD shows the accepted value with the "OK 2" message, and then the meter returns to the normal measuring mode.

Note: When the calibration procedure is completed, the "CAL" tag is turned on.

To quit calibration and to reset to the default values:

After entering the calibration mode and before the first point is accepted, it is possible to quit the procedure and return to the last calibration data by pressing the MODE button. The secondary LCD displays "ESC" for 1 second and the meter returns to the normal measuring mode. To reset to the default values and clear a previous calibration, press the SET/HOLD button after entering the calibration mode and before the first point is accepted. The secondary LCD displays "CLR" for 1 second, the meter resets to the default calibration and the "CAL" tag on the LCD disappears.

YSI 85 instruction manual excerpt:

(<http://www.yei.com/media/pdfs/038503-YSI-Model-85-Operations-Manual-RevE.pdf>)

5.1 CALIBRATION OF DISSOLVED OXYGEN

To accurately calibrate the YSI Model 85 you will need to know the approximate altitude of the region in which you are located.

1. Ensure that the sponge inside the instrument's calibration chamber is wet. Insert the probe into the calibration chamber.
2. Turn the instrument on by pressing the ON/OFF button on the front of the instrument. Press the MODE button until dissolved oxygen is displayed in mg/L or %. Wait for the dissolved oxygen and temperature readings to stabilize (usually 15 minutes is required).
3. Use two fingers to press and release both the UP ARROW and DOWN ARROW buttons at the same time.

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4. The LCD will prompt you to enter the local altitude in hundreds of feet. Use the arrow keys to increase or decrease the altitude. When the proper altitude appears on the LCD, press the ENTER button once. EXAMPLE: Entering the number 12 here indicates 1200 feet.

5. The Model 85 should now display CAL in the lower left of the display, the calibration value should be displayed in the lower right of the display and the current % reading (before calibration) should be on the main display. Make sure that the current % reading (large display) is stable, then press the ENTER button. The display should read SAVE then should return to the Normal Operation Mode.

Each time the Model 85 is turned off, it may be necessary to re-calibrate before taking measurements. All calibrations should be completed at a temperature which is as close as possible to the sample temperature. Dissolved oxygen readings are only as good as the calibration.

DO saturation at 20-30° C	
Temperature (°C)	DO (mg/l)
20	9.07
21	8.9
22	8.72
23	8.56
24	8.4
25	8.24
26	8.09
27	7.95
28	7.81
29	7.67
30	7.54