and cable **417**. A 120-volt AC power supply **422** is provided to module **420** for use in opening or closing water control valves, sounding alarms, and similar functions. In this embodiment, module **420** provides output control of solenoid valve **144**, water sampler **146**, and control signal **148**. Solenoid valve controller **144**, in response to a signal from controller **10** via termination panel **140**, provides water to sensor **22** for sensing water characteristics from either source via stream or control water source. In this way, sensor **22** can be calibrated automatically by controller **32** using the known water characteristics of control water source. Sensor **22** is a commercially available water quality analyzer such as the H_2O multiprobe available from by Hydrolab, Inc.

Control signal **148** may be used to energize a simple audible alarm and lamp to warn of a water quality problem, or it may be a previously established response procedure to automatically isolate or correct the cause of the problem. The latter is accomplished for a given application of the invention with the assistance of local facility engineers using standard equipment and procedures. For example, corrective action at a particular water treatment facility may call for additional holding time in a reaction vessel, aeration pond, or the like before the water is discharged to the environment. In the case where system **10** is used to monitor a source of drinking water before it enters a potable water system, automated corrective action may call for immediate isolation of water source to prevent it from entering the potable water system until the water quality problem has been resolved. As illustrated in the above discussion, system **10** provides a general-purpose portable automated biomonitoring system for use in monitoring the water quality of any source of water, and is readily integrated with other control systems or data monitoring devices.

Although shown and described is what is believed to be the most practical and preferred embodiments, it is apparent that departures from specific designs and methods described and shown will suggest themselves to those skilled in the art and may be used without departing from the spirit and scope of the invention. The present invention is not restricted to the particular constructions described and illustrated, but should be constructed to cohere with all modifications that may fall within the scope of the appended claims.

We claim:

1. A portable system for monitoring and evaluating water quality using ventilatory behavior and body movement of an aquatic organism, comprising:

an exposure chamber for housing an aquatic organism;

a water inlet for directing water to the exposure chamber;

an electrode for sensing and quantifying ventilatory behavior and body movement of said aquatic organism into data and outputting said data as a behavioral signal;

a controller for receiving the behavioral signal and determining a plurality of ventilatory parameters based on the behavioral signal;

a recirculating apparatus for recirculating water to the exposure chamber, the recirculating apparatus comprising a water reservoir, a water quality sensor and a pump for pumping the water from the water reservoir through the water quality sensor and into the exposure chamber; and

a first portable housing;

wherein the exposure chamber, electrode, water reservoir and pump are disposed within the first housing.

2. The system of claim **1**, wherein the water quality sensor is pivotally attached to the exterior of the first housing via a calibration bracket.

3. The system of claim **1**, further comprising:

a second portable housing in communication with the first portable housing; and

electrical components disposed within the second housing;

wherein the water quality sensor is pivotally attached to the exterior of the first housing and the second housing.

4. A portable system for monitoring and evaluating water quality using ventilatory behavior and body movement of an aquatic organism, comprising:

an exposure chamber for housing an aquatic organism;

a water inlet for directing water to the exposure chamber;

an electrode for sensing and quantifying ventilatory behavior and body movement of said aquatic organism into data and outputting said data as a behavioral signal;

a controller for receiving the behavioral signal and determining a plurality of ventilatory parameters based on the behavioral signal;

a recirculating apparatus for recirculating water to the exposure chamber; and

a heater/chiller unit for controlling a temperature of water being tested by the system.

5. The system of claim **4**, wherein the recirculating apparatus comprises:

a water reservoir;

a water quality sensor; and

a pump for pumping the water from the water reservoir through the water quality sensor and into the exposure chamber.

6. The system of claim **5**, wherein the recirculating apparatus further comprises:

a water distribution manifold for dividing the water before it enters the exposure chamber.

7. The system of claim **5**, wherein the water quality sensor senses a characteristic of water supplied to the exposure chamber, wherein the controller is responsive to the water quality sensor by comparing the water characteristic with the corresponding behavioral signal to determine when a change in one or more of the ventilatory parameters occurred at the approximate time that a change in water characteristic occurred.

8. The system of claim **7**, wherein the water characteristic includes dissolved oxygen level and temperature.

9. The system of claim **4**, further comprising:

a backup aeration device for preventing suffocation of the aquatic organism in the case of water loss from the system or electrical failure of the system.

10. The system of claim **4**, wherein the controller further determines when one or more of the parameters exceed a threshold.

11. The system of claim **4**, wherein the controller determines ventilatory frequency, average ventilatory depth, and cough rate of the organism based on the behavioral signal.

12. The system of claim **4**, further comprising:

a water sampler responsive to the controller for automatically sampling water supplied to the exposure chamber for subsequent analysis.

13. The system of claim **4**, wherein the exposure chamber is supplied with water to be discharged into the environment, including means for directing the water into a holding tank when the controller determines that one or more of the ventilatory parameters exceed a threshold.