Collections climate standards for the Marine Biodiversity Center (MBC)/Polychaete and Crustacea/Echinoderm collection spaces

Jenessa Wall (Marine Biodiversity Center)

The climate (temperature, humidity, and air circulation) in which both ethanol wet-preserved and dry biological collections are stored is critical for the indefinite conservation of the specimens they contain. Collections containing only one kind of material are ideal for setting a standard temperature and humidity, as only one material needs to be considered and no compromises need to be made to accommodate the needs of multiple materials. The Marine Biodiversity Center (MBC)/Polychaete and Crustacea/Echinoderm collections contain both types of collections. Hence we are faced with the dilemma of having both wet-preserved and dry specimens in a single storage area.

Wet-preserved specimens are mostly susceptible to fluctuations in temperature, which causes jar lids to loosen over time due to differential expansion rates of the glass jars and plastic lids[1]. Loose lids permit evaporation of the ethanol and subsequent deterioration of the specimens. **Dry biological collections** are susceptible to fungal (mold) attack resulting from excessive humidity and temperature. Mold spores are ubiquitous in the environment and all biological specimens contain the organic material on which mold can propagate[2]. Mold can grow at 60% relative humidity[a] (RH) and above[3]. Since no surfaces are dust–free, mold can grow on inorganic substrates as well. Temperature and humidity are directly interrelated and also affect the rate at which mold can grow. Consequently it is essential to specify proper targets for both temperature and RH.

A controlled, stable environment for the long-term preservation of these natural history specimens held in trust by the Museum is of utmost importance. Due to the mixed nature of these collections, the climate should be targeted to conservation of the dry specimens, since they are sensitive to both temperature and RH, while wet collections are mainly sensitive to temperature fluctuation. In addition, it is necessary to maintain the proper airflow for a healthy working environment.

To maintain temperature and RH levels that are stable enough for long-term preservation, monitoring is crucial, to both assist in achieving the goals and to prevent damage from large variations if systems fail[5]. The MBC has continuous records of temperature and RH in the MBC/Polychaete and Crustacea/Echinoderm spaces every 15 minutes since January 2014, is currently monitoring airflow on a weekly basis, and will continue to monitor in support of collections climate control. Climate is measured with Onset UX-100-003 loggers and airflow with an AAB ABM-200 airflow meter.

The American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) sets standards for the outdoor airflow[b] necessary to properly ventilate occupiable storage rooms for liquids or gels[4], based on floor area and occupancy. ASHRAE also has guidelines on temperature and RH levels for museum spaces[3]. Based on the ASHRAE industry standards, as well as the literature on museum conservation, Table 1 summarizes the temperature, relative humidity, and airflow targets that should be achieved and maintained in the collection spaces.

Table 1. Climate Control Targets

Collection Room	*Temperature (°F)*	*Relative Humidity (%)*	*Airflow* (cfm)*
MBC/Polychaete	65 ± 4	45 ± 10	514 – 654
Crustacea/Echinoderm	65 ± 4	45 ± 10	256 – 396

** Airflow range is based on occupancy ranging from 2 staff members to a full tour group.*

[a] *Relative humidity* is the ratio (expressed as a percentage) of the amount of moisture actually in the air to the maximum amount that can be present at that temperature.

[b] *Outdoor airflow* is ambient air in the ventilation supply air. If ventilation air includes recirculated indoor air, the total supply airflow rates must be adjusted proportionally.

References

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