

APPENDIX E:

Aquariums and Terrariums

Starting a Freshwater Aquarium

A 5- or 10-gallon tank is recommended, but use whatever is available. Clean thoroughly with soap and ammonia water and rinse several times. Place where a strong diffused light is available (north or east exposures are good). Add enough aquarium sand or gravel to cover the bottom an inch or two deep, but be sure that it has first been washed in running water until all debris is removed. Then fill the tank three-quarters full of water (if chlorinated, let it stand a day or two before adding animals).

Add healthy plants to help oxygenate the water and to provide protection for small fishes. The roots of *Vallisneria*, *Sagittaria*, and the like should be spread out, covered to the crown, and pressed down to anchor. Stalks of *Anacharis* sp. (formerly *Elodea*), *Colomba*, *Myriophyllum*, and so on can be weighted down with small stones. Now add water to within an inch of the top. Unless dead or decaying matter is present, the water will be clear in a day or two. Provide a glass cover for the tank.

Animals can be added after several days. Avoid animals that require running water and those that uproot plants and stir up the bottom (turtles, for example). Do not crowd the tank. A good rule for fish is 1 inch of fish to each gallon of water. Snails are good scavengers, and up to a dozen pond snails can be kept in a 6-gallon aquarium. Small native fish and newts are interesting, and a clam will illustrate filter feeding, but be sure its siphons are working, since a dead animal soon fouls the water.

Examine the tank daily, trim off dead leaves, and remove any dead animals immediately. Avoid overfeeding because decaying food may foul the water and kill the animals.

Microaquariums can be prepared in almost any small container.

Starting a Marine Aquarium

A marine aquarium should be in operation for at least two weeks before it is stocked with animals, so begin your preparations early. For a permanent aquarium, the

larger the size the better; a minimum of 10 gallons is recommended, although smaller containers are suitable for temporary holding (see below). The aquarium can be all glass, or plexiglass, or even a plastic-lined wooden container, but absolutely no metal should be exposed to the seawater.

An under-gravel filter that recirculates water by air-lift should cover the bottom of the tank, and about three inches of well-washed calcareous pebbles or limestone (dolomite is ideal) should be spread over the filter (avoid the siliceous gravel usually sold at aquarium shops). The gravel particles must be large enough to avoid clogging the slits in the filter. For burrowing animals, the gravel can be covered with well-washed coarse beach sand or extremely well-washed crushed oyster shell (available in some feed stores). This combination of the filter and the gravel aerates the water through an air-lift tube and keeps the water circulating through the gravel, which filters out organic matter. Here various bacteria decompose the organic particles, converting toxic ammonia and urea to nitrites and nitrites to nitrates, which are nontoxic.

If desired, an auxiliary outside filter equipped with filter floss and charcoal can be used along with the under-gravel filter. This is a necessity if the tank is to be heavily loaded with animals.

Filtered natural seawater can be used if available, but quite satisfactory artificial seawater can be made up from commercially available synthetic salts. Mixing tanks can be any nonmetal container; large plastic trash containers, if sturdy, are satisfactory.

When filling the aquarium, pour the water onto a dish or piece of glass placed over the gravel to avoid stirring up the bottom. When the setup is complete and the filters are running, wait two weeks to establish a bacterial population before adding animals. About every four to six weeks one-fourth of the water should be siphoned off and replaced with fresh salt solution (more often if the tank is heavily loaded). A glass tank cover will slow down evaporation. Replace evaporated water with fresh tap water.

Optimum temperatures for tropical animals lie between 21° and 29° C; for North Atlantic or Pacific species it lies between 7° and 18° C. Do not place the aquarium in a window; it needs standard, diffuse light.

Many invertebrates such as sea anemones, corals, sea cucumbers, sea stars, sea squirts, crabs, and the like can live for months, even years, in such a properly cared for aquarium. It is important not to overload the tank. About 18 to 20 medium-sized invertebrates can be handled in a 20-gallon tank, but less if fish are added. Filter feeders can be fed freshly hatched brine shrimp; carnivores can be fed small bits of fish, clam, or shrimp.

More information is available from such sources as Aquarium Systems, Inc., Eastlake, Ohio, or the Carolina Biological Supply Company, Burlington, North Carolina, or Powell Laboratories Division, Gladstone, Oregon. For additional reading we suggest the following literature.

References

- Berg, C. J., Jr. (ed.). 1983. Culture of marine invertebrates: selected readings. Stroudsburg, PA, Hutchinson Ross Publishing Company. *Contributed chapters on mariculture system design, water quality, nutrition, diseases, and related topics.*
- Diehl, F. A., J. B. Freeley, and D. G. Gibson. 1971. Experiments using marine animals. Eastlake, Ohio, Aquarium Systems, Inc.
- Laboratory Animal Management: Marine Invertebrates. 1981. Washington, D.C. (Committee on Marine Invertebrates, National Research Council). *This two-part manual summarizes methods for maintaining and rearing marine invertebrates in laboratories with no access to the sea.*
- Spotte, S. H. 1970. Fish and invertebrate culture: water management in closed systems. New York, John Wiley & Sons, Inc.
- Straugham, R. P. L. 1970. The salt-water aquarium in the home, ed. 2. New York, A. S. Barnes & Company.

Small Marine Aquariums

Small culture or demonstration aquariums can be made from wide-mouthed gallon jars filled with natural or artificial seawater and filtered with small inexpensive

plastic outside filters of the two-compartment type that use filter floss and charcoal in one of the compartments. A series of such jars can be set up using three-way valves and can be connected to a compressed air outlet or an aquarium pump.

Starting a Terrarium

A terrarium can be any watertight container of suitable size, from a dishpan or battery jar to an aquarium or terrarium fitted with a glass cover. Larger containers are usually easier to plant and maintain. A north window location of 18° to 22° C temperature is ideal for woodland terrariums; a sunny spot and a 27° to 32° C temperature is ideal for desert forms. Avoid heavy soil as plants need root ventilation. Provide a false bottom of hardware cloth and cover it with gravel, or else cover the bottom of the terrarium with gravel.

For a woodland terrarium, use one part sand and three parts humus mixed thoroughly and spread over the gravel. Moisten till it clings together loosely but does not cake. Planted with mosses, lichens, liverworts, wood ferns, and the like, it is suitable for newts, toads, salamanders, frogs, chameleons, small snakes, snails, and insects. Provide a glass cover to conserve moisture. For a semiaquatic terrarium, a container may be added for a small pool and the woodland soil built up around it, higher at one end. Some aquatic and semiaquatic animals can then be added.

The desert terrarium needs only an inch or two of coarse sand in the bottom, slightly dampened and covered with a half inch or so of desert sand. It can be covered with a screen. Cactus roots should be dampened before planting and the sand sprinkled lightly. Scorpions, lizards, snakes, spiders, and other such species may be added.

Most terrarium problems are caused by excessive moisture or temperature. If it is too moist, remove the cover for a part of each day. When plants become crowded, trim them or thin them out.