

for Silver Springs in table 10. This drift catching procedure is further discussed in relation to ordinary streams in the theory section.

c. Oxygen gradient method

If the springs are a flow system in which the constant flow of nutritive clear water is mixed at the boil with sunshine to start a biological chain of reaction, then the distance down the run is proportional to the rate of reaction in some chemical kinetic apparatus. Thus this property is the basis for a third measure of plant production in the springs. As water comes out of the springs it possesses a nearly constant oxygen value diurnally and annually as seen in figure 8. Oxygen is added as the large river of water pours downstream due to two actions: diffusion from the air, and photosynthesis associated with production. At the constant temperature day and night the rate of diffusion will be constant. Thus the difference between the oxygen value down the run in the day and that at night is the difference between photosynthesis and respiration. Thus one has measured the metabolism of the whole community, the size of a small lake, directly and instantaneously. Indeed one can measure instantaneously the production rate during the day versus seasons, cloud cover, etc.

The data in tables 2 and 10 for Silver and Green Cove, and figures 8 and 9, abundantly illustrate that this method indeed is practical. Although incomplete, the data at hand show a large difference between cloudy and sunny days and between winter and summer. This is exciting especially as it permits rapid comparisons of springs and probably can be adapted to streams and rivers and even estuaries if a knowledge of current and simultaneous observations can be made. Certainly, the criticism that communities are too big to work with directly seems circumvented here. Some initial data on other springs suggest similar orders of magnitude. These springs are giant respirometers.

Green Cove Springs as one of the small springs showed (in table 2) an especially striking contrast between summer afternoon where trees are such that sun reaches the spring run, summer night where oxygen actually decreases down the run, and winter night and day where the sun does not reach the plants and where because of a removal of plants the production and also the night respiration was decreased indicating the difference between diffusion and respiration in producing the D.O.

If these oxygen data are correct it should be possible to develop check techniques with carbon-dioxide or pH shift of constant alkalinity water. The constancy of the downstream alkalinity has to be proved.

With valid methods of measuring the large dominant aquatic higher plants in most of the springs, attempts are being made now to develop methods of measuring production of algae, animals, etc. Cage measurements can be made on the medium and larger animals, bottle respiration can be resorted to for algae, fish tagging has begun.