

(7) The rate of feeding in marine organisms generally increases gradually, then drops off abruptly as oxygen decreases. This is in part due to the critical physiological stress placed on the organisms themselves and partly because the food upon which they are feeding—plankton, bottom invertebrates, fishes—may decrease in abundance, may migrate completely to a new region, or be killed off outright.

Reproductive cycles may be changed significantly by the addition of heated effluents. Spawning may not occur at all because temperatures are too high, especially for species ordinarily spawning in winter, while in some cases spawning may occur too early, when conditions are less favorable in terms of food, and other environmental conditions, for the young to survive. The rate of settling of invertebrate larvae is dependent upon temperature, and this may be favorable or not. Finally, the number of eggs produced by a species is temperature-dependent, with some species producing more eggs at lower temperatures and other species laying more eggs at higher temperatures.

(9) Pollutants usually work not singly but in a combination of several factors. A given amount of waste, such as domestic sewage, refinery wastes, oils, tars, insecticides, detergents, synthetic fibers, and fertilizers, more effectively deplete water of oxygen and increase in their chronic toxicity at higher water temperatures and high salinities. The effect of these is synergistic—two toxic compounds are more powerful acting together than is each other working separately.

(10) Finally, pollution does not necessarily have to cause an actual kill of any of the organisms within a food web to make an area unproductive. Destruction of the habitat, an increasing factor in the depletion of Florida's natural resources, is sufficient to eradicate any number of species without adding a single chemical pollutant. For example, temperatures too high for turtle grass to survive, or for coral or sponges to grow, or for mangroves to flourish, could in itself be sufficient to destroy a habitat of Biscayne Bay. And if one adds any of the pollutants now or potentially being added to Biscayne Bay, the toxic effects of high temperatures are increased considerably.

In freshwater we know that heavy discharges of organic wastes can fertilize water to such an extent, through excesses of nitrogen and phosphorus, that plant growth is greatly augmented. Under high water temperature conditions algae, in particular, bloom prodigiously. Two things may occur under such circumstances: (1) too much dissolved oxygen is liberated by such plants into the water during full sunlight and fish are killed by a condition of supersaturation, exhibiting "pop-eyes" and skin bubbles, or (2) the reverse photosynthetic process takes place under darkness (at night, or on cloudy or foggy days) and the dissolved oxygen is removed from the water and carbon dioxide is given off by the plants—the fish die either from lack of sufficient oxygen or an over-abundance of carbon dioxide. In addition, the dissolved oxygen retaining capability of the water is lessened at higher temperatures, as was previously noted for marine waters.

The National Technical Advisory Committee to the Federal Water Pollution Control Administration on Water Quality Criteria for Fish, and other Aquatic Life, and Wildlife, early had established specific limitations on water temperatures in their Interim Report. We feel that there is great need to heed the advice given by these expert aquatic scientists comprising the NTAC, to adopt these as the official guide of the FWPCA, playing an important role in the Internal Review Board's approval or disapproval of State Standards now before them.

We do not feel that thermal pollution is something we must live with, any more than we feel that some of our waterways must be designated as "sewers." We are convinced that current day technology is adequate to combat the problem effectively. Advances in cooling towers, closed cooling circuits, thermal cooling ponds, and the various combinations of these can return discharge water to the temperature of the intake waters. We would feel that with adequate temperature safety margins built into our water quality standards on interstate and navigable waters that a degree of protection is available here if proper enforcement is enacted.

We have been somewhat taken aback by the Atomic Energy Commission's attitude concerning thermal pollution inasmuch as they denied any statutory recourse in matters other than control over radiological wastes. The growth of nuclear-fueled steam-electric-power plants is well-evidenced and noted in our SFI Bulletin No. 191 (see page 2) as attached to this testimony. Too, it has been