

realization abroad now that this limit is being reached esthetically spacewise, and as regards production of food.

Mr. DADDARIO. We can't eliminate the fact that the earth might some day just shrug its shoulders and destroy us all. It can do even this if we do the best possible job.

Dr. RAY. It can.

Mr. DADDARIO. But there also is the possibility if we don't recognize what we are doing, that we can create a chain of circumstances which we set about and by ourselves set an irreversible tide in motion which will destroy us. That is what we are talking about here.

Dr. RAY. This is a point. And particularly I like your idea, Mr. Chairman, of tying into our technological programs a fact-finding biological, physical subprogram. I think that we have already set in motion a couple of things which are extremely dangerous, of which the burning of fossil fuels is the most obvious one I can think of; its effect upon the oceans and—the effect of putting carbon dioxide, for instance. I think that these overall considerations are major ones, and again the major consideration of the International Biological Program. The earth is a unit, not politically unfortunately, but it certainly is a unit biologically.

Mr. DADDARIO. If we could understand some of these things better it probably could feed itself into political judgments in a better way than it does now.

One of the witnesses before us as an example told us about one area of our country where the virgin forests have been destroyed for the necessary purpose of getting open fields so we could grow oats and wheat to feed ourselves. But during a period of time when there has been intense heat in that area, it was the wheat and the oats which suffered and it was the natural grasses and trees in the area which were able to adapt themselves to these changes. I think we can read into that the importance of maintaining the natural processes on the surface of the earth. And if we understand it better, maybe we will do things in the right way.

Dr. RAY. Well, I think two points might be mentioned in this very respect, two very fundamental ecological considerations.

In the first place, in man's alteration of his environment, he has usually done two things: (1) he has brought in foreign species or exotics; and (2) he has simplified the environment. Where he had 100 species before, maybe now he has 10.

Now what these two things do usually is first, if a foreign species is brought in, usually the total biomass is reduced. The total productivity of the land may seem to be better in corn than it was in shrubbery and so forth, but it is really not. The biomass is reduced. This means that we are reaping a harvest, but we are not reaping as great a harvest.

Now, what about the variability of the harvest? In planting let's say elm trees all along our streets, rather than having an elm here, an oak here, and something else there, we have opened up a very simple problem in epidemiology. In simplifying the environment, therefore, in two respects, we have damaged it. We have come to know this lately.

But now let's go to the sea. We are starting to talk about fish farming. What are we going to do, wall off a bay and put in just mullet, as some people do, or milkfish, or are we going to maintain the almost