

management. It has already been demonstrated that one hybrid will grow 30% faster than either parent species. Such growth is of immediate concern to the fish farmer since this could possibly mean a 30% greater dollar yield. The potential of the hybrids cannot be fully realized without adequate research, and this will require numerous small ponds so that each group of hybrids under test can be kept separate for extensive periods of time.

By 1973, nearly 100 companies are expected to be engaged in marine agriculture. Some oysters or clams probably will be raised for market on well-regulated farms. Basic research programs for effective industry development of agriculture must be begun now.

FISH PROTEIN CONCENTRATE

Situation and outlook

The human body can function properly only within a narrow range of physiological limitations, reflecting what it needs in terms of nutrients it can derive or synthesize from the food it consumes. Nutritionists recognize that sufficient food is neither an adequate remedy for hunger nor a guarantee of adequate nutrition. An overabundance of any single food ingredient in the diet of peoples suffering from malnutrition may even aggravate the conditions and speed the onset of sickness or death. In short, a satisfactory diet must contain—in addition to carbohydrates, vitamins, minerals, and water—not only an adequate supply of proteins which the body can synthesize for repair or replacement of body tissues, but also an adequate supply of those other highly specific protein elements which the body needs but cannot synthesize.

Proteins are composed of chains of amino acids, some of which—the so-called “nonessential” amino acids—the human body can synthesize from other forms of ingested food materials. Other amino acids, however, are called “essential” inasmuch as the body unconditionally requires them to insure its normal health and growth but cannot synthesize them itself. These essential amino acids must, therefore, be contained in the food eaten. The absence of essential amino acids from many diets is responsible for certain widespread, malignant deficiency diseases, and for the most general type of malnutrition. Facing this problem, the newly formed National Council on Marine Resources and Engineering Development proposed that the United States embark on a major long-range program to exploit the oceans as a source of animal protein to help feed the undernourished people of the world. Convinced that the manufacture of fish protein concentrate (FPC) provides an expedient method of acquiring an unused source of animal protein from the sea, the Council has placed the FPC program among the top eight programs that should receive priority attention.

Fish protein concentrate, produced by the Bureau of Commercial Fisheries solvent extraction method using isopropanol, is a dry, almost odorless, tasteless powder. It is bacteriologically and biochemically safe. It is stable without refrigeration or other special preservation techniques, making it particularly useful because much of the need is in areas where preservation methods are unavailable or not well developed.

The total protein content of the finished product is about 80%, much higher than most protein sources now available for human consumption. FPC also contains a high level of valuable minerals and vitamins. It is a valuable dietary supplement when used in such food products as noodles, prepared cereals, milk shakes, gravies, soups, etc.

National significance

Realizing the need to develop a highly nutritious protein concentrate, the Bureau of Commercial Fisheries embarked on a comprehensive research program for the manufacture of FPC. Its purposes were twofold: (1) to provide new market outlets for underutilized species of fish off our coasts and thus assist the depressed segments of the commercial fishing industry, and (2) to develop an inexpensive, high-quality animal protein supplement to help alleviate malnutrition in many developing areas of the world.

Needs

There is a lack of clinical information indicating any clear-cut protein deficiencies in the United States today, compared with many of the less developed nations. However, it is becoming more fully recognized that even small protein deficiencies result in listlessness and general lack of ambition even though the cases are not advanced enough to result in death or high susceptibility to disease. The need for FPC in the United States is not so demonstrable in correcting wide-