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A MEMORANDUM ON MIXED SPECIES PROBLEMS

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Only a few studies have dealt with dynamics of mixed species populations. Indeed the species is the most fundamental unit in ecology and fishery biology. Nevertheless the mixed species problems become more and more important in stock assessment and fishery management. This memorandum lists some points of interests.

1. Significances

There are two reasons for treating this topic. First, Quantitative change of a species population appears to be related with abundances of food and predator species, or with environmental factors that affect incidently several species. Second reason occurs from practice of evaluating effort of a fishery that depends on a number of species populations.

No tuna species appears to depend on a particular forage species. Neither any destructive predator nor parasitic organism is known. Thus there may occur no serious change of the tuna populations due to direct relation with othe other organisms.

However, some tuna species exhibited fluctuations related with other tunas or non-tuna fishes, e.g. bluefin tuna and other neritic-pelagic fishes in the western Pacific: and yellowfin and skipjack in tropical tuna fisheries. Concluding these phenomena needs further studies on species preference of fishery, on selectivity of gears and finally on environments together with dynamics of the species in question.

Most fisheries catch more than one species. Amount of total nominal effort does not always give indices of fishing intensity on a species. Effective effort of tuna longline fishery on yellowfin and albacore showed good coincidence with actual change of operations in the Atlantic Ocean (Shiohama 1971). Further investigations are necessary for obtaining measures of species preference of more movable fisheries such as purse seining.

2. Protection of particular species in the community

Difference of biological productivity including natality, growth and mortality often makes a fishery regulation for a species forbide rational exploitation of the other fishes. In this regard there appear two steps of examinations.

The first is to find any way to protect one species with the least sacrifice of exploitaton of the other fishes. The Inter-American Tropical Tuna Commission has provided a good example by setting quota of yellowfin tuna and allowable ratio of the species after free operation period. Another solution is based on difference in distribution ranges of tuna species. Even from widely operating longline fishery a tuna species population may be protected by limiting amount of effort in the major distribution range of the species (Suda 1972).

The second examination appraaches significance of the regulation. In spite of introduction of the above regulatory measures, it is not always possible to catch selectively one species form the others in the sea. In such cases, the regulatory measures must be determined not only from biological evidences but also from social conciderations. Kibesaki (1960) suggested, in his careful

criticisms, significance of expansion of trawl fishery in the East China Sea resulting in production of 21,000 tons of croakers even though it reduced catch of yellow sea bream from 5,000 tons to 200 tons.

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