SUMMARY OF THE NATIONAL SURVEY OF NEEDS FOR HATCHERY FISH

By Edward C. Kinney
Bureau of Sport Fisheries and Wildlife
Washington, D. C.

ABSTRACT

The National Survey of Needs for Hatchery Fish was a cooperative effort by the Bureau of Sport Fisheries and Wildlife and the 50 States to obtain information for estimating future nationwide requirements for hatchery fish. During 1966, data were collected on present and future: (1) amount and types of sport fish habitat; (2) amount and types of habitat stocked; (3) numbers and types of fishermen; (4) stocking requirements; and (5) hatchery fish production capabilities. Inland fishing waters amounted to nearly 82 million acres in 1965 and will increase 10 million acres by 2000. Half of the waters are stocked. There were 29 million freshwater fishermen in 1965 and by 2000 there will be almost 64 million. There was a deficit of 287 million hatchery salmon in 1965 and by 1980 the deficit may reach 709 million. Requirements for trout exceeded production in 1965 by 1 million pounds and future deficits are forecast. About two-thirds billion more warm-water fish were required in 1965 than were produced. Future deficits will be about one-third of a billion annually. Marine waters to the 3-mile limit amounted to 70 million acres. In 1965 there were 13 million salt-water anglers, nearly half of whom fished in Florida. By the year 2000 there will be 29.4 million salt-water fishermen. Except for anadromous fishes stocked in fresh water, no marine species were stocked in 1965. Eight of the coastal States are considering stocking of marine fishes.

INTRODUCTION

The purpose of the National Survey of Needs for Hatchery Fish was to collect information to guide State and Federal fishery managers in their efforts to provide recreational fishing to a rapidly increasing number of anglers.

The survey was prompted by remarks made by John S. Gottschalk, Director of the Bureau of Sport Fisheries and Wildlife, during an address given at the 1966 Northeast Fish and Wildlife Conference. Director Gottschalk suggested a greater effort be made of relating our hatchery output--kind, size, quality, and number--to the waters to be stocked and that a national survey be made of present and future stocking needs as a basis for formulating future hatchery plans.

During the spring of 1966, a survey was designed to obtain the desired data for the year 1965 with projections for 1973, 1980, and 2000. During the fall and winter of 1966, data were collected from Federal and State conservation agencies on present and future: (1) amount and types of sport fish habitat; (2) amount and types of habitat stocked; (3) numbers and types of fishermen; (4) stocking requirements; and (5) hatchery fish production capabilities.

METHODS

The survey and forms were designed by a committee of six fishery biologist of the Bureau of Sport Fisheries and Wildlife with assistance from the Office of the Assistant Secretary for Fish and Wildlife and Parks. After approval by the Bureau of the Budget, the forms were field tested in Virginia.

Sets of the instructions, forms, glossary, and data on population projections and general tidal shoreline distances were provided the State and Federal agencies in August 1966. During October and November, two Bureau biologists called upon each State fish and game department to assist in filling out the forms. In June 1967 a statistical section containing a 107-page summary of the data was provided the cooperators for review. The corrections and changes were made late in 1967 and the narrative was written early in 1968. The narrative was further revised after being reviewed by the cooperators and has been prepared for publication by the fall of 1968.

SUMMARY OF THE RESULTS

There was considerable variation in the quality of the data obtained. Some States and Federal agencies had excellent data. For others, it was a matter of assembling the known data and estimating the unknown. Most agencies had accurate quantitative information on a few of the categories. Very few agencies had projected figures to the year 2000.

The following is a summary of the data for the United States.

INLAND WATERS

The weakest data on inland fishing waters involved stream acreages, small streams in particular. Excellent data were available on existing reservoir acreages and for reservoirs proposed by 1975.

Amount of water

In 1965, there were 81.6 million acres of inland fishing waters. The Great Lakes with 38.7 million acres in the United States and Alaska with nearly 12.4 million acres make up about 63 percent of these waters. This leaves 30.5 million acres for the interior of the United States. By the year 2000, there will be an increase of 10.1 million acres, mostly in the form of interior reservoirs.

Types of water

For the purpose of the survey, cold water was defined as "water capable of supporting salmonids," and warm water was defined as "water which is too warm to support salmonids." Waters were defined in this manner as it was thought that the stocking of salmonids would have greater significance in regard to stocking requirements.

About two-thirds of our inland waters were classified as cold waters, i.e., capable of supporting salmonids. Although not determined by the survey, a significant amount of this cold water supports warm-water fisheries. About 4.5 million acres or 8.3 percent of the cold waters were in streams. The 27.4 million acres classified as warm waters included nearly 20 million acres of lakes and reservoirs, 5 million acres of streams, and 2.2 million acres of farm ponds. It is anticipated that by the year 2000, cold waters will increase by 1.4 million acres and warm waters will increase by 8.7 million acres.

Waters stocked

The data obtained on the acres stocked are not particularly meaningful. Most of the survey participants provided data on acres stocked or to be stocked annually. However, some provided data on acreages to be stocked periodically.

It was found that 60 percent of the cold waters are and will be stocked. About one-third of the warm waters required periodic stocking around 1965 and by the year 2000, 38 percent will require periodic stocking.

Data on fishermen

The data on numbers of fishermen include nonresidents and there is duplication wherever a fisherman fished in two or more States. Data for 1965 are quite similar to that obtained by the National Survey of Fishing and Hunting if the nonresidents are excluded from the Hatchery Survey data. The States which have special trout licenses had excellent data on trout anglers.

Three-fourths of the 29 million anglers reported for 1965 were warm-water fishermen. By the year 2000, the number of fishermen will more than double and reach 63.5 million. The ratio of 3 warm-water to 1 cold-water fisherman will remain fairly constant over the 35-year period.

The average fisherman fishes about 13 days per year and will continue to fish at this rate. Trout and salmon fishermen average from 9 to 10 days per year while warm-water anglers average 14 to 15 days.

Hatchery facilities

In 1965, there were 410 State and 92 National fish hatcheries. About two-thirds were cold-water hatcheries. The average annual production per trout hatchery was 65 thousand pounds. The average warm-water hatchery produced 9 thousand pounds

including 6.6 million fry, 860 thousand fingerlings, and nearly 11 thousand catchables.

Requirements and production of hatchery fish

Separate forms were used to collect data on requirements for hatchery fish and production capabilities. The forms were sufficiently different so that direct comparison of requirements with production could not be made in certain instances.

It was found that present and projected requirements for hatchery fish were much greater than the supply.

TROUT

The total number of trout produced in 1965 exceeded the requirements by 4.2 million, but in weight there was a deficit of about 1 million pounds. By 1973 the deficit will be reduced to less than 0.5 million pounds with several new hatcheries now planned or under construction, but by the year 2000 the deficit may reach 7 million pounds.

By weight, about 91 percent of the trout stocked during 1965 were catchables. The average size of catchable trout stocked in the various States ranged from 7.6 to 11.0 inches total length. The national average was 8.5 inches.

Trout production in 1965 was nearly 18 million pounds and the production projected for the year 2000 will be 38 million pounds. About 200 to 300 new hatcheries will be required to produce the additional 20 million pounds. The projected requirements for the year 2000 exceed the production by about 7 million pounds. To make up this deficit would require an additional 70 to 100 hatcheries.

SALMON

Federal and State hatcheries produced 287 million salmon in 1965. Based on optimistic plans for increased hatcheries and spawning channels, production will reach 478 million by 1973 and 709 million by 1980.

Salmon production in 1965 was less than the requirement by almost 3 million fry, 162 thousand fingerlings, and 1.1 million yearlings. By 1973, requirements may exceed production by 10.6 million fish and by 1980 the deficit may reach 21.2 million.

WARM-WATER FISH

During 1965, 168 Federal and State hatcheries produced nearly 1.2 billion warm-water fish including 1.1 billion fry, 136 million fingerlings and 1.7 million catchables. Yet, the requirements for that year exceeded the supply by 683 million fish including 559 million fry, 122 million fingerlings, and 2 million catchables. These figures do not present the entire picture as many of the species required were different than those produced. Future production increases are anticipated and under present plans the deficit may be reduced to one-third of a billion fish by 1973 and remain at about this level to the end of the century.

About half of the 1965 requirements for fingerlings were for the usual hatchery species of largemouth bass, bluegill, channel catfish, and some redear sunfish. Prominent among the other species needed were muskellunge, northern pike, striped bass, striped bass X white bass hybrids, and walleye. Thirty of the States which require these latter species do not have readily available sources of eggs or fry.

It is estimated that in order to meet future needs the following additional facilities are required:

1. From 6 to 25 egg taking and fry stations of from 25 to 100 million capacities.
2. From 25 to 40 fingerling rearing stations of 3 to 5 million capacities.
3. From 600 to 1,000 acres of ponds for rearing catchables. (These were estimated on capacities of from 1,000 to 1,500 pounds production per acre.)

MARINE WATERS

Habitat

Marine waters of the United States, extending 3 miles out from the coasts, amounted to 70 million acres. This figure is conservative as data were lacking for many estuaries and embayments.

Fishermen

The States reported nearly 12 million salt-water fishermen for 1965. This figure includes nonresidents so there is some duplication. Some 6 million or nearly half of the marine fishermen were reported from Florida. The data were based on a comprehensive survey by the Governor's Committee on Recreational Development (1963). The survey contains projections to the year 2000. By 2000, the number of marine fishermen will increase by 125 percent and reach 29.4 million.

Stocking

Excluding anadromous species, no marine fish were stocked in the oceans in 1965. During the latter part of the 19th century and until about 1950, billions of marine fishes were stocked annually along the Atlantic Coast. During 1936, the U. S. Bureau of Fisheries stocked 2.2 billion fry including Atlantic cod, flounder, haddock, herring, mackerel, pollock, and American shad. At least 8 of the 23 coastal States are considering stocking marine and additional anadromous fishes. The States which are considering stocking of striped bass include Delaware, Louisiana, Maryland, Massachusetts, and Virginia. Louisiana is considering stocking croaker, pompano, redfish, sleeper, snook, and spotted sea trout. Maryland and Virginia are also considering species other than striped bass. The State of Washington plans to stock chinook and coho salmon in marine waters.

Fishery biologists are confronted with two problems with respect to stocking hatchery fish in the oceans.

First are the problems associated with the culture of marine species. New hatchery and rearing facilities would be required. The rearing of marine species to fingerling or yearling size would probably involve new methods of feeding, handling, and disease control.

The second major problem would be evaluation of the stockings. This would involve marking of most of the fish initially stocked and periodic recovery of marked fish to determine growth and survival rates.

SPECIES DIVERSITY SPECIES ABUNDANCE OF FISH POPULATIONS: AN EXAMINATION OF VARIOUS METHODS

By Andrew J. McErlean and Joseph A. Mihursky
University of Maryland Natural Resources Institute
Hallowing Point Station, Prince Frederick, Maryland

ABSTRACT

Twenty sets of fish collection data were used to compare seven diversity indices. The data sets were chosen to represent the wide variation in habitat, ecologic condition, salinity, as well as other factors, encountered in fishery work.

Cross comparisons of several index rankings were made and the dependencies of the various indices discussed. Variation of index score with number of species and with sample size was examined. Results indicate four indices may be applied to fishery work.

INTRODUCTION

Although many diversity indices have been suggested scant attention has been paid to the application of these measures to fish populations and assemblages. The fishery worker is at a disadvantage in this regard and historically has relied on species lists to report his findings. This paper examines and compares seven such indices and evaluates the potential usefullness to the fishery scientist.

Diversity indices have been shown to be useful measures of natural populations (ex. Menhinick, 1964; Wilhm, 1967; Preston, 1948; Fisher et al. 1943). In most instances, a value (d) is derived from the relationship of number of species (S)