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AN EVALUATION OF FISH POPULATION STUDIES BY FLORIDA HAUL SEINE

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ABSTRACT

The technique of operation of the haul seine as traditionally used in the large fresh water bodies of Florida is discussed. Limiting factors inherent in the sampling device are enumerated and illustrated by seine catches from several lakes. Rotenone studies from some of these lakes are contrasted with the seine catches. The results of creel census studies in lakes extensively fished by sportsmen, by reflecting proportionate quantities of game fishes similar to quantities taken in the haul seine, are quoted as further validation for its use in qualitative population sampling. Difficulties in quantitative sampling by this method are discussed. It is shown to be of questionable value when employed for approaching absolute terms such as productivity in pounds per acre except in certain special cases. The value of the haul seine for purely relative comparisons is emphasized.

A little more than ten years ago quantitative data regarding Florida's fresh water fish populations were almost non-existent. A rapid increase in sportfishing produced social and economic pressures which caused official outlaw of the commercial sale of gamefishes. Angry rebuttals from the commercial fishing interests were followed by the Florida Commission's establishment of lacustrine studies. At first concentrated on the St. Johns River and Lake Okeechobee, these investigations utilized the traditional Florida haul seine as the principal sampling device (Dequine, 1951). Detailed records of thousands of individual seine hauls and their accompanying temporal circumstances were eventually accumulated from many lakes throughout the state; thus our present large-scale program of sportfishing improvement was born.

The basic principle involved in seining is the physical surrounding of a volume of water, from surface to bottom, with a net, and the capture of the fishes thus confined. A body of water may be completely or partially enclosed by the seine. Mesh size as well as degree of water coverage determines quantities of fishes taken. It also obviously governs minimum age and size classes of fishes available to it (Huish, 1954). A knowledge of net dimensions and amount of water area covered is essential for sampling evaluations.

The commercial haul seines used in Florida were of large size, measuring from several hundred feet to about a mile in length. The minimum mesh consisted of webbing from two inches to four inches, stretched measurement.

Generally inboard gasoline-powered launches were used to operate the net, water area enclosed or covered consisted of a few acres to several hundreds of acres (dependent on length of the net and distance it was towed or hauled through the water), and usually large quantities of fishes were taken (Moody, 1954). Commission personnel observed and kept records of the catches.

Early in the work on Okeechobee and the St. Johns it was evident that proportions of the various species of fishes in the representative seine haul remained constant through months of sampling (Dequine, 1950). That the haul seine nearly reflected comparative amounts of actual specific abundance in the sampled waters then became a more tenable conclusion than its alternate hypothesis: subsequent rotenone sampling in the same waters confirm the soundness of the deduction (Crittenden and Barkuloo, 1956). Rough fish control and population sampling in numerous lakes by a variety of methods (Moody, 1954; Huish, 1955, 1956 (a, b, c,); Moody, 1957) give further validation to its reliability.

A knowledge of productivity in terms of pounds of fishes per unit water area or volume is important to enlightened management (Swingle, 1950). However, except where the lake can be completely covered with one haul of the net, as in Deer Island Lake (Huish, ms. in press), determinations of area encircled applied to fishes taken result in a merely relative index of productivity. In 1951 the catch from Deer Island Lake amounted to more than a thousand pounds of fishes per acre (Huish *op. cit*), while the average catch from the commercial seines on Lake George over a two-year period was less than three thousand pounds and represented less than fifty pounds per acre (unpublished data). Fish population density appears to have been adequately measured by the Deer Island Lake haul but not by those made in the St. Johns River.

Difficulties involved in obtaining a truly representative sample of numbers inhabiting a given natural body are formidable. It is not possible to immobilize fishes in a measured volume of water and/or to tabulate them as stationery beans on the IBM machines. Numerous workers (Aldrich, 1938; Bennett, 1954; Bowers, 1956 and others) hint at indications of learning ability; on at least one occasion in the St. Johns River the writer has observed many more mullet escaping a haul seine than were captured.

Rotenone sampling generally takes fishes in the same proportionate order of specific abundance as the haul seine (Lake Trafford, Huish, unpublished data; Lake Apopka, Moody, unpublished data, and others). Where sportfishing pressure was adequate for all game species, creel checks moreover indicated that gamefishes were caught in the same degree of abundance as by haul seine (Moody, 1957).

As a working tool in large shallow lakes for gaging population changes the haul seine is invaluable. When available, historical net data is regularly consulted in cases of diminished sportfishing success; *e. g.*, in Lake Apopka fishing has gradually deteriorated during the past several years. It was possible to compare seining records dating back to 1949 (Dequine, 1950) with haul seine sampling in 1956. Supplementary rotenone studies confirmed the haul seine diagnosis (Moody, unpublished data). Remedial measures in the form of selective rotenoning for gizzard shad were recommended and are now envisaged.

Human manipulation of fish populations in large Florida lakes has now become a reality through chemical controls. Selective poisoning for gizzard shad has been demonstrated the most important means yet discovered for improving sportfishing success (Lake Trafford, Newnans Lake, Starke Lake, etc.; unpublished data). The role of haul seine sampling is one of evaluating fish population status and rate of changes (Lake Morton: Moody, 1955; Lake Hunter: Huish, 1955; Lake Trafford: Huish, 1956c; Lake Hollingsworth: Huish, 1956a; Starke Lake: Huish, 1956b; Newnans Lake, etc.: unpublished data).

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AN EVALUATION OF SOME OF THE FACTORS AFFECTING THE VALIDITY OF ROTENONE SAMPLING DATA

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The rotenone method of sampling fish populations is widely used throughout the southeast, and is generally accepted as the best available method for obtaining complete information about fish populations in most natural lakes and man made impoundments. However, as Swingle (1950) has pointed out, the information obtained often contains certain inaccuracies. Nevertheless, many workers accept the data without considering these inaccuracies. Because of this we would like to critically evaluate some of the factors which affect the validity of rotenone sampling data.

Tarzwell (1942) compared the results of fish population studies obtained from rotenone poisoning, gill nets, set lines, seining, hoop nets, and sport fishing records and concluded that the rotenone poisoning yielded the most complete information about the fish population—the other methods were considered to be selective for certain species and size groups of fish.

Swingle (1950) discussed how incomplete recovery of fish following rotenone poisoning can affect the accuracy of the data obtained. Several workers (Krumholz, 1944; Ball, 1948, and others) have reported varying percentages of previously marked fish recovered from rotenone samples. According to Swingle (1950) many workers make little attempt to include complete records of small fish with their sampling data. Serious bias can result from the failure to adequately account for small fish and the variation in the amounts of fish recovered from different samples due to incomplete kill and/or pick up of fish.

There seems to be little standardization of the methods used to take rotenone samples. Some workers surround the area to be sampled with nets; other workers mark the area to be sampled with floats; while still others simply apply a curtain of poison around the sample area. A standardization in methods