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Georges Bank has long been a major fishing ground of North America fishermen for several centuries. During the 1960's and early 1970's it was the site of an intensive multispecies distant water fleet fishery when vessels of many nations fished these waters. The catch peaked in 1972 at 625,000 tons, which is considered in excess of long term sustainable levels.

Fishery resources can be discussed in terms of species and stocks. A stock is a component of a species which is essentially resident in a particular area (although the area occupied can change with abundance) with relatively little interbreeding with stocks of the same species from other areas. The fishery resources on Georges Bank include stocks which are primarily resident on the Bank. These include stocks of cod, haddock, silver hake, red hake, yellowtail flounder, winter flounder, and several others of lesser numerical importance in the catch. These resources are supported by the basic productivity of the Georges Bank area. For harvesting to be done on a sustained basis, it cannot equal or exceed the production of the resource, that is, the increase in the weight of a given stock within a year resulting from a combination of the reproduction of that stock (recruitment) and the growth of individual fish of the stock. What man can harvest on a sustainable basis is the difference between this total production and that which goes towards natural mortality. Natural mortality results primarily from such things as being eaten by other species. The amount produced in a given species in a given year varies with environmental conditions. The driving force in determining the abundance of most marine populations is the result of successful reproduction with survival through the egg and larval period to fish of a size and age which recruit to the fishable and spawning stocks. It is in the early life stages that environmental conditions appear to be the major determinant of population abundance. Marine populations have existed under varying fluctuations in environmental conditions. The assessment of the productivity of these stocks takes into account these fluctuations due to environment. However, it does assume that these environmental fluctuations vary about an average, that is, there will be good years for survival and poorer years for survival. The addition of non natural stress to the survival of eggs and larvae presents an unknown condition for assessment of future sustainable yields.

In addition to the production of resident stocks, there are a large number of other species which spend part of the yearly cycle on Georges Bank and therefore part of their annual production can be attributed to Georges Bank. These species include those for whom the Georges Bank area is of critical importance in their life cycle such as Atlantic herring which spawn on the Bank, as well as other species such as swordfish which move through part of Georges Bank during the warmer months. Important species which move through Georges Bank in terms of tonnage in addition



to the two mentioned above include mackerel, pollock, Illex and Loligo squid, dogfish (becoming a more important component of the fishery), bluefish (part of its population moves out to Georges Bank during the summer), tuna, whales, butterfish, scup, river herring (alewives and blueback herring primarily), and a number of species of lesser abundance. In addition, Georges Bank has important shellfish resources with lobsters found in the canyons on the outer edge of Georges Bank and in shallow water areas during spawning and egg hatching seasons. Jonah crabs and red crabs are also found in the deeper water canyons. Scallops are resident in a number of areas on the Bank and due to the generally clockwise current movements on Georges Bank are able to have their spawning product maintained on the Bank, and thus, are essentially a self-supporting population. With this general background, certain key species are discussed further below.

Cod are generally fished along with haddock, the two species being the core of the traditional New England groundfish fishery. Cod on Georges Bank are at a relatively high level, and recent catches exceed 35,000 metric tons per year. The average sustainable long term catch for the Georges Bank area is estimated to be between 30,000-35,000 metric tons. Studies since the 1930's have indicated that haddock can support an average sustainable yield of between 40,000 and 50,000 metric tons. However, in the early 1960's extremely heavy fishing by the combined fleets of the US, Canada, and the USSR drove the haddock stock to extremely low levels. For almost a decade very little reproduction occurred and annual yields were less than 10,000 metric tons. In the 1970's, with reduced pressure resulting from international regulations, haddock began to recover. In 1975, extremely good reproduction occurred. This single year of haddock spawning was successful enough to increase the size of the resource to earlier levels. Only in 1963 had spawning been more successful. However, the population consisted predominantly of a single year class rather than several. Management measures were applied which held the catch of haddock below that which could easily be caught considering its abundance. This was done in order to allow the stock to maintain itself longer at a high level until other year classes recruited and the stock returned to a more normal population structure. The New England Regional Fishery Management Council, by attempting to manage the catch, has succeeded in keeping the spawning stocks at a larger level than would have otherwise occurred and there are indications that the 1978 year class, though not as large as the 1975, is also of good size. The jury is still out as to whether these restrictions have been sufficient to maintain the resource at levels typical of the period before the intense fishing pressure of the 1960's or whether the stock will again decline somewhat before having the opportunity to eventually build back up to the level where one would expect yearly harvests on a sustained basis of 40,000-50,000 metric tons.

Yellowtail flounder is the third of the three major species that have traditionally been the mainstay of New England trawlers on Georges Bank. Yellowtail flounder on Georges Bank, were in a period of high abundance in the 1960's. However, as yellowtail flounder were being heavily fished by US fleets,

significant input of USSR effort in the late 1960's resulted in a rapid decline of the stocks to a level at which the US effort alone was more than capable of harvesting the surplus production from the resource. Management imposed first by ICNAF and lately the New England Regional Fishery Management Council have been intended to maintain the stock at current levels until improved reproduction occurs. There is some indication for the Georges Bank area that this is now beginning to happen. If the incoming recruitment is allowed to rebuild the stocks and several years of good recruitment occur, one can look forward again to sustainable catches of about 16,000 metric tons per year.

Silver hake, or whiting as it is called in the market, is one of the major resources of Georges Bank. Silver hake have not been significantly fished on Georges Bank by the United States in recent years. The fishery has been, during the past twenty years, predominantly a distant water fleet fishery. The US yearly catch generally being less than 10,000 metric tons. The stock is now in good condition and catches of about 55,000 metric tons could be supported on the average from this resource.

It is also worth noting the status of some major stocks which move through the Georges Bank area. Atlantic herring spawn primarily on Georges Bank, but winter to the south and west. It is obvious that most of their productivity is gained on the Georges Bank area. As a result of extremely heavy fishing by many nations, combined with only occasional good year classes, the stock on Georges is now at an extremely low level of abundance. In recent years, almost no spawning has been observed. The US fishery continues to concentrate on inshore stocks in the Gulf of Maine and has never taken significant amounts from the Georges Bank area. Based on historical records, it is possible that as much as 120,000 metric tons of herring could be harvested annually on average from this stock. It is realized, of course, that for this species, large fluctuations in production frequently occur. Although current yields are an order of magnitude less than its long term potential, given current restrictions imposed on the fishery, with sufficient time, one would expect the resource to again rebuild.

Atlantic mackerel is a species which ranges from Cape Hatteras to the Gulf of St. Lawrence. During both mackerel's spring movement north and its return in the autumn to over-wintering areas, the stock moves through Georges Bank. During these seasonal migrations the stock feeds and thus part of production of this resource depends on the productivity of Georges Bank. Although mackerel, like herring, are a species that fluctuates considerably in abundance, it is now at lower abundance than it was in the early 1970's. The abundance of mackerel during the 1970's was not necessarily typical of the resource historically. Nevertheless, indications are that the stock is rebuilding as a result of current harvest levels being maintained at less than current surplus production. Estimates of long term sustainable average yields are difficult for mackerel, because of wide fluctuations and thus many years are required in order to obtain a reasonable average. However, indications are that the average yield may be in the neighborhood of 220,000 metric tons, a significant proportion of which is the result of production from feeding on Georges Bank.

It is well known that the fisheries on Georges Bank are mixed. Vessels harvest as many as 10 different species on a given trip - species such as scup, butterfish, white hake, ocean pout, winter flounder, squids, dogfish, etc. Attempts have been made to estimate the total sustainable yield of all resources combined for Georges Bank, the Gulf of Maine, Southern New England, and the Mid-Atlantic area. The total yield for all species of finfish plus squid on an annual sustainable basis is estimated to be 900,000 metric tons. In considering this yield it should be realized that the proportion produced by each species differs from year to year. There appears to be more stability in the total annual production over all species than for any individual species. Rebuilding of the stocks began with increased management under ICNAF in the early 1970's, followed by more extreme restrictions under the Fishery Management and Conservation Act. These restrictions have resulted in the total resource recovering close to what it was prior to the impact of the distant water fleets. It should be noted, however, that despite this recovery in terms of total abundance the structure of much of the population on Georges Bank is not in as healthy, robust condition as existed earlier. Under earlier conditions most fish populations consisted of several age groups in good abundance. Under such conditions occasional low year classes did not greatly affect the total spawning stock nor the abundance available for the fishery. The present situation can be characterized by dependence on one or very few age groups for the largest part of the abundance of many species. This situation is much more sensitive to a boom or bust situation depending on the yearly successful reproduction and surviving of that reproduction to fishable and spawning stocks. A significant proportion of at least half of the fishery resources off the northeast coast is due to Georges Bank. Attempts have been made to calculate the productivity on Georges Bank by assigning fractions of the production of species which occupy Georges Bank for only part of the year. These indicate the production on Georges Bank to be about 17,000 kilocalories per kilometer squared. This is almost twice the productivity on a unit area basis of that found in the North Sea, a traditionally productive fishing ground off the northwest coast of Europe. This productivity indicates that possibly half of the sustainable yield for the total area from the Gulf of Maine to Cape Hatteras can be attributed to a relatively small area, Georges Bank.

Finally, one should say a few words about the shellfish resources of Georges Bank. The major shellfish fishery is for scallops. Like all marine organisms, scallop populations are subject to fluctuations in abundance and unlike the finfish populations where the ups and downs of various species tend to be counter balanced by other species, the scallop fishery is a single species fishery. The fishery has been at record high levels for the last few years when both US and Canadian catches are considered. More than 15,000 metric tons of scallop meats were taken from Georges Bank in 1977 through 1979. The greatest share of this has been taken by Canadian vessels on the productive Northern Edge area. Scallops are also taken by the US fleet to the south and west of Georges Bank. Heavy fishing for scallops during the past few years has reduced the overall abundance as the good recruitment that supported the fishery earlier over all areas has not been maintained. The most consistent area of recruitment, however, is the Northern Edge of Georges Bank, which to date has been fished most heavily by Canadians. The scallop resource on Georges Bank should on an average sustain catches around 8,000-10,000 metric tons of scallops, meat weight.