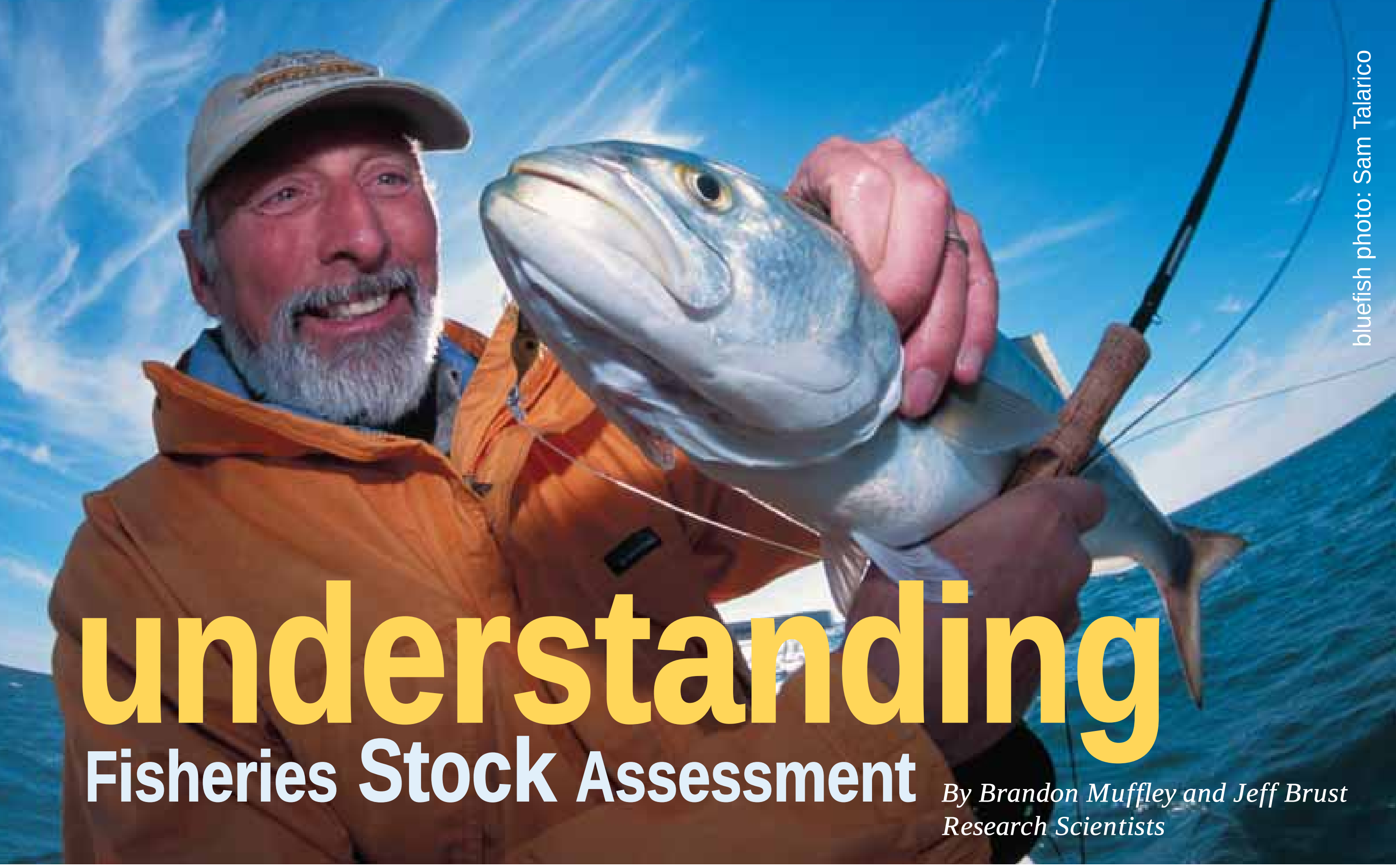

bluefish photo: Sam Talarico

understanding Fisheries Stock Assessment

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Research Scientists

As the sun rises on another muggy summer morning, an eager crew of marine biologists load their survey boat with nets, measuring boards, buckets and survey meters and head out to sample fish populations in the Delaware River. After disembarking on a small section of undeveloped beach along the New Jersey shoreline, the biologists cast a 100-foot net to try to catch various creatures inhabiting the shallow waters near the beach, particularly juvenile striped bass. Pulling the net onto the beach, the biologists find hundreds of small fish such as bay anchovy, bluefish, white perch, herring and the targeted species - striped bass.

Now the activity really picks up as biologists begin to sort the catch by species, count each fish and measure the lengths of some of the fish. This work is just the beginning of the stock assessment process, generally done to estimate the number of animals in a particular population. Although fishery surveys are the heart of stock assessments, the process is much more complex than counting the number of fish in a net.

Today, assessment biologists must have an understanding of sampling methods, species life history, recreational and commercial fisheries, various assessment models and fisheries management strategies. Fisheries management requires cooperation among numerous state agencies, the federal government, fisheries managers, biologists, anglers and the public.

The first step in stock assessment is compiling the information about the species being assessed, often from several sources and numerous states. Fish species data is grouped into two categories: fishery-dependent and fishery-independent information. Fishery-*dependent* data is collected on fish caught in the recreational and commercial fisheries and can include information on the number of fish caught and kept; the number caught and released; fishing effort; socioeconomic data; and the age, length and weight of individual fish. The Striped Bass Bonus Program and Striped Bass Volunteer Angler Survey are examples of fishery-dependent data collected by the New Jersey Department of Environmental Protection's Division of Fish and Wildlife. Scientists collect fishery-*independent* data through surveys that are not associated with a recreational or commercial fishery. This data includes juvenile abundance, adult abundance, sex information, fish age and environmental data. The ocean trawl survey (see page 20) and the striped bass juvenile seine survey in the Delaware River are just two examples of the numerous fishery-independent studies conducted by Fish & Wildlife.

Both fishery-dependent and fishery-independent data provide scientists with information on species life history, abundance and fishery activity. Examples of life history data include growth rate, age when sexual maturity is reached, number of eggs produced by mature females, and the number of fish which die of natural causes in a given

(continued on page 21)

ASSESSMENT (continued from page 4)

year. Abundance data examples include an estimate of the number or weight of all fish in the population. Fishery activity data could include the number or weight of fish in each age class that are harvested and discarded, for example.

The second step in stock assessment is to standardize the data because different states use different collection techniques. For example, New Jersey and Delaware both conduct trawl surveys in the Delaware Bay, but use different nets and sampling methods. Before the data can be compared, it must be converted to a standard unit of measure. In other instances, the number of samples collected from a state might be insufficient, so fishery survey data from adjoining states must be added to fill the gaps. This procedure is common with age and length samples from recreational and commercial fisheries.

Another standardization technique is to combine fishery data from different sources. For example, lengths and ages collected in numerous trawl surveys can be combined to determine the average length of fish at a given age. This age-length key could then be applied to a sample of lengths from the recreational and/or commercial fishery to estimate the number of fish harvested at each age. These calculations require an understanding of the data collection methods used and the type of assessment or computer model to be performed.

After the data is compiled and standardized, biologists conduct the actual stock assessment. A stock assessment can be as simple as analyzing trends in abundance and landings or as complex as running an intricate mathematical model with dozens of input sources such as trawl surveys, commercial sampling surveys and various life history information. The assessment can analyze the stock as a whole or divide it into different sectors (such as age classes) and analyze each sector separately. The type of computer model that is run will depend on the types and amount of data available and how the fishery is usually managed, either through a harvest quota or a specified fishing mortality.

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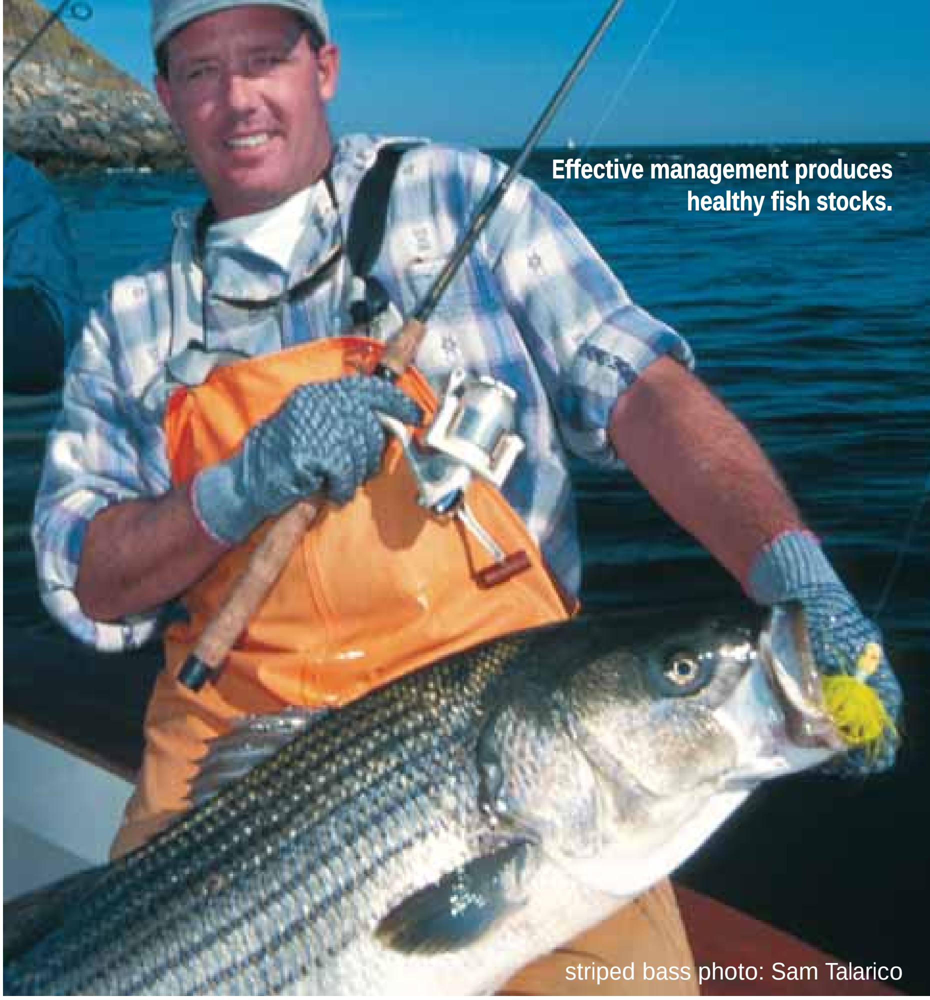

Effective management produces healthy fish stocks.

striped bass photo: Sam Talarico

ASSESSMENT *(continued from page 21)*

Once the model has been run, assessment biologists interpret the results; it is a complex task. Generally, the same model is run several times with slightly different input data. This method allows the scientists to evaluate how different data can influence results, helping to ensure the model is performing correctly and is appropriate for the species being assessed. Often, a second type of model is computed and compared with the main assessment model to see if they achieve similar results; if they differ, the goal is to determine why.

Finally, the assessment results are used to determine the stock status, which is based on two criteria: 1.) the number of fish removed from the stock through fishing activities and 2.) the number of fish in the population, particularly the mature females. For both criteria management reference points which define a healthy stock are established, such as maximum sustainable yield or fishing effort. Biologists compare the assessment results to these reference points and make determinations on stock status, which managers then use to formulate management strategies and regulations for the future.

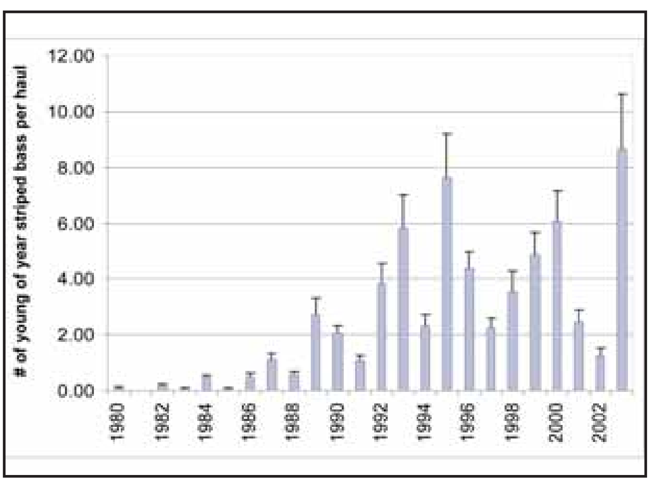

Figure 1. *The average number of striped bass less than one year old caught per seine net haul (each time the net is set) in the Delaware River. Stock assessment biologists use this type of information to help estimate the size of future populations of striped bass.*

Fisheries managers set regulations to ensure the stock size remains at or above a level that allows the stock to maintain itself year after year. If stock size falls below that level, the stock will get smaller every year unless action is taken to reverse the decline. When the stock is not overharvested, the fishery should remain relatively stable from year to year, allowing recreational and commercial anglers and others to enjoy the resource without causing its collapse.

New Jersey has a strong record of collecting relevant fisheries data for important recreational and commercial species. That success is being enhanced with the addition of two biologists dedicated to conducting and analyzing fisheries stock assessments. Because many important species in New Jersey are managed in collaboration with other Atlantic coastal states and the federal government, the interests of New Jersey anglers now will be well represented in the development and interpretation of stock assessments. As data collection expands, New Jersey's stock assessment capabilities will continue to improve and possibly lead to more flexible fisheries management measures such as the recreational striped bass regulations set in last year.

New Jersey's commitment to enhanced stock assessment strengthens its goal of balancing and protecting the fisheries while maintaining healthy recreational and commercial harvest levels.