

Introduction To Marine Fisheries Management

Have you ever wondered why there are seasons and size and bag limits for the fish you catch?

Ever wondered how those decisions are made?

This publication provides answers to those questions as it describes the methods used in science-based management. It also highlights the management process used to conserve Florida's fisheries resources.



Sharing the Fish

Wild fish are renewable natural resources. Healthy fish populations are able to continually replenish individuals lost to natural death and fishing. However, this cycle of a healthy population can be disrupted when fish are taken faster than they can replenish themselves. This is known as **overfishing**. One of the main reasons fisheries can become **overfished** is that many different user groups share the resource. This problem is referred to as "the tragedy of the commons." When everyone takes home large numbers of fish without considering the effects of their removal, the fish eventually run out. Many people do not realize that fish populations are renewable, but not infinite.

Ethical fishing practices and fisheries management can help maintain fish populations. Fisheries management protects and enhances wild populations for the benefit of Florida's residents, visitors, and future generations.

How do we know the status of fish populations?

Biologists periodically conduct

stock assessments that document the condition of wild stocks of fish or invertebrates. Management recommendations are based on stock assessments. To assemble a stock assessment, scientists gather detailed information about the life history of the species they are studying. The Florida Fish and Wildlife Conservation Commission's (FWC) Fish and Wildlife Research Institute (FWRI) has teams of scientists that collect various types of data used to make these assessments. The final report identifies the species' vulnerability to overfishing. Following the stock assessment, a management strategy for the fishery may be designed to plan the steps needed to maintain or rebuild fish populations to a sustainable level.

What type of information is collected?

When assembling a stock assessment, it is important to collect the most complete data possible to accurately portray the status of a fish stock. Biologists collect the data in a variety of ways, and later fisheries managers analyze the data when reviewing the results of current regulations and considering new ones.

Fisheries data generally fall into two categories: fishery dependent and fishery independent. **Fishery dependent** data is obtained from fishermen's catches. Both commercial and recreational fishermen are interviewed to obtain data such as fish size, number and location caught, and the effort used to catch the fish, whether it was harvested or released. **Effort** takes into account the equipment used as well as the time spent fishing. These data are used to calculate a value known as **catch per unit effort (CPUE)**.

Fast Fact:

Overfishing vs. Overfished

Did you know a fish population can be overfished while not suffering from overfishing? The term **overfished** refers to a population that has become so small it requires management action to increase its numbers. **Overfishing** occurs when the rate of harvest is higher than the population's natural replenishment rate.



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Fast Fact:

Recreational Fishing Data

- Marine Recreational Fisheries Statistics Survey (MRFSS): Collects fishery data such as the number of fish caught and released and fishing effort used.
- Marine Recreational Information Program (MRIP): A new system of surveys (replacing MRFSS) that is improving data collection, analysis, and use of recreational saltwater fishing information.
- These surveys are just a portion of the information used by biologists to assess a stock.

Fishery independent data is information collected by biologists in planned scientific studies. In addition to the gear used by the fisher, researchers conducting fisheries independent monitoring use a variety of techniques and equipment to learn about the population as a whole, from juveniles to mature adults. Sometimes the fish are fitted with tags or tracking devices and are released, which enables researchers to study their migratory and spawning habits. Some fish are harvested and dissected to learn about their life history. Researchers examine fish otoliths, or earstones, which are structures similar to bones and found in the inner ear of fish. Otoliths form annual rings, like the trunk of a tree. These rings can be counted to estimate the age of the fish. The contents of the digestive system tell scientists about fish dietary habits. Reproductive organs are examined to determine gender and spawning potential.

How are fish caught for scientific research?

Biologists use a wide variety of gears to gather fishery independent data. Plankton nets have extremely small mesh that allows researchers to collect larval fish for examination. Seine nets and otter trawls are two types of nets that are commonly used to sample juvenile and adult fish.

A **seine net** is pulled by hand in shallow areas. Floats along the top and weights along the bottom keep the net open so the entire water column is sampled.



An **otter trawl** is a cone-shaped net that is pulled by a boat over the sea floor. It is kept open during trawling by floats and boards, which pull outward to make a wide opening.

In order to sample populations the same way a recreational angler would, scientists also use standard hook and line gear to collect data.

Fast Fact:

Fish Reproduction

A population's **Spawning Potential Ratio (SPR)** is the ratio of the total weight of mature fish (usually mature females) in a fished population to the total weight that would exist if the population was not fished. Fishery managers work to ensure that this ratio is high enough to prevent biological decline.

TIME OUT! What does all this mean?

Let's take a minute to go over a few scientific terms commonly used in fisheries management.

- **Fishery** – All activities involved in catching a species of fish or group of species.
- **Fish Population vs. Fish Stock** – A fish population is a group of fish that live in the same area. A stock is a management unit of a population. One population can be made up of several stocks that are considered separate due to distinct migratory ranges, geographic barriers, or other non-genetic differences.
- **Stock Assessment** – A report that summarizes the biological condition of a fish stock. It includes a history of the fishery, impacts of management actions over time, age ranges, gender ratios, and predictions for the stock based on current trends.
- **Catch Per Unit Effort (CPUE)** – The number of fish or invertebrates caught per amount of time compared to the fishing power used for harvest. CPUE directly relates to the relative abundance of fish in a stock. It is a good evaluation tool, and part of what makes a comprehensive assessment.

Fast Fact:

Escapement

Escapement is the proportion of fish that survive through a certain age, relative to the number of fish that would have survived if there were no fishery. For example, red drum stocks are monitored in Florida by determining their escapement.



How are fisheries actually managed?

There are many strategies employed by fisheries managers to help ensure fish stocks are maintained for future generations. Following fishing regulations is one of the ways everyone can help support the resource.

Many species of fish in Florida are managed using size restrictions. Fish that are caught that do not meet size limits are required to be released. To protect small fish of some species, **minimum size limits** are set to allow juvenile fish to survive long enough to reproduce. Sometimes **maximum size limits** are used to prevent anglers from removing large fish from the fishery because mature individuals are important contributors to the growth of the population. Fish that are managed using a **slot limit** have both a minimum and maximum size limit. While slot limits are beneficial to some species of fish (for example, red drum), this type of regulation is not appropriate for all fish.

Whenever a fish of appropriate size is landed, it is also important to remember to limit your take. **Bag limits** set a maximum number of fish allowed to be harvested per day. In Florida several species, including flounder, are regulated in this way. Bag limits are especially important to the health of species that swim in large schools or engage in aggregate spawning, because it may be possible to catch many of these fish during one fishing trip. It is important to note that bag limits have been carefully calculated by biologists to sustain populations for the next generation of fishermen. You can help conserve fish species by following these limits.

There are also closed seasons for several fish species. **Closed seasons** designate certain periods of the year when harvest is prohibited. These seasons are usually meant to protect a fish during a vulnerable time in its development or life history. For example, spotted seatrout are protected during their spawning season.

In extreme cases, the population of a species of fish may be so low

Fast Fact:

Aggregate spawning

When a species engages in aggregate spawning, mature members of the population come together for a mass breeding event.

or vulnerable to overexploitation (whether due to human activity or natural causes), that managers may completely prohibit harvest of the fish. The **prohibited species** then has a chance to increase in numbers without fishing pressure. However, the recovery of a fish stock is a slow process because many species are long-lived and mature late in life.

If you happen to catch a fish that needs to be released, following proper catch and release techniques gives the fish the best possible chance of survival.



Who are the fisheries managers?

Fisheries are managed at state, interstate, and federal levels. In Florida, the FWC is responsible for managing fisheries activity extending out to three nautical miles on the Atlantic coast and nine nautical miles on the Gulf coast. The FWC actively conducts fisheries research and implements new management strategies on a regular basis. A considerable amount of work goes into the execution of a new management strategy. The first step taken is the collection of data by biologists and the completion of a formal stock assessment. FWC staff then provide management recommendations,

based on the stock assessment, to the FWC Commissioners, who are appointed by the governor of Florida. At various stages in this process, public comments are gathered. The Commissioners review all this information and eventually vote on which regulations should be implemented to achieve management goals.



To manage fish stocks that cross multiple state boundaries, interstate commissions coordinate data collection and management strategies among member-states. The Gulf States Marine Fisheries Commission (GSMFC) is made up of states bordering the Gulf of Mexico and the Atlantic States Marine Fisheries Commission (ASMFC) is comprised of states bordering the Atlantic coast.

When anglers travel beyond state water boundaries into federal waters, they are subject to regulations set forth by federal managers. Federal waters are called the **Exclusive Economic Zone (EEZ)** and extend to 200 nautical miles beyond shore. The groups responsible for monitoring the fish in these areas include the South Atlantic Fishery Management Council (SAFMC), the Gulf of Mexico Fishery Management Council (GMFMC), and NOAA Fisheries Service (sometimes referred to as the National Marine Fisheries Service, or NMFS). Refer to the resource section to learn more about federal fisheries management.



Consistency in State and Federal Regulations

While the FWC manages fish species within Florida state waters, federal fishery agencies are responsible for species beyond state boundaries. However, there are some species (such as mackerel) that inhabit both nearshore and offshore waters. In these cases, the FWC and federal agencies share management duties. The Magnuson-Stevens Fishery Conservation and Management Act (Act) mandates how federal fisheries are regulated and how the Councils operate. The Act helps ensure that state and federal fishing regulations and management strategies are consistent with one another to conserve fishery resources. At times, the FWC may consider altering state regulations in order to become consistent with federal regulations. A few of the advantages of consistency between state and federal regulations include minimal confusion for anglers, ease of enforcement, and aid in the recovery of fish stocks.

Additional Fisheries Management Terms

Total mortality (Z) – The annual rate of fish deaths due to both natural causes and fishing. $Z=M+F$

- **Natural mortality (M)** – The annual rate of fish deaths due to natural causes
- **Fishing mortality (F)** – The annual rate of fish deaths due to fishing pressure

Discard mortality – The percentage of fish that die after being released. This catch may be a non-targeted species (bycatch) or targeted species not meeting harvest criteria. This is sometimes called cryptic mortality.

Bycatch – A caught non-targeted species. It may be discarded (called discard catch) or harvested if legal (called incidental catch).

Fecundity – The number of eggs produced per female per spawning season.

Magnuson-Stevens Fishery Conservation and Management Act

– A federal law that directs NOAA Fisheries Service to manage and conserve fisheries in the Exclusive Economic Zone (EEZ). The Act created eight regional fishery councils to advise the NOAA Fisheries Service on fishery management issues.

Going Deeper...

When the Act was reauthorized in 2006, deadlines to end overfishing, rebuild overfished stocks, and create specific harvest limits were established. Other major goals of the Act are to improve fisheries data collection and the use of science-based management to build sustainable fisheries. The successful rebuilding of the king and Spanish mackerel fishery, which was overfished in the 1970s and 1980s, is attributed to science-based management measures implemented under the Act. Today, the mackerel fishery is considered sustainable and remains a viable fishery for both recreational and commercial fishermen.

Marine Fisheries Management Information Resources

FWC Division of Marine Fisheries Management – www.MyFWC.com/fishing

South Atlantic Fishery Management Council – www.safmc.net

Gulf of Mexico Fishery Management Council – www.gulfcouncil.org

Atlantic States Marine Fisheries Commission – www.asmfmc.org

Gulf States Marine Fisheries Commission – www.gsmfc.org

NOAA Fisheries Service – www.nmfs.noaa.gov

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Florida Marine Fisheries Management in a Nutshell

