

Population Distribution Study of Atlantic **Billfish** Species

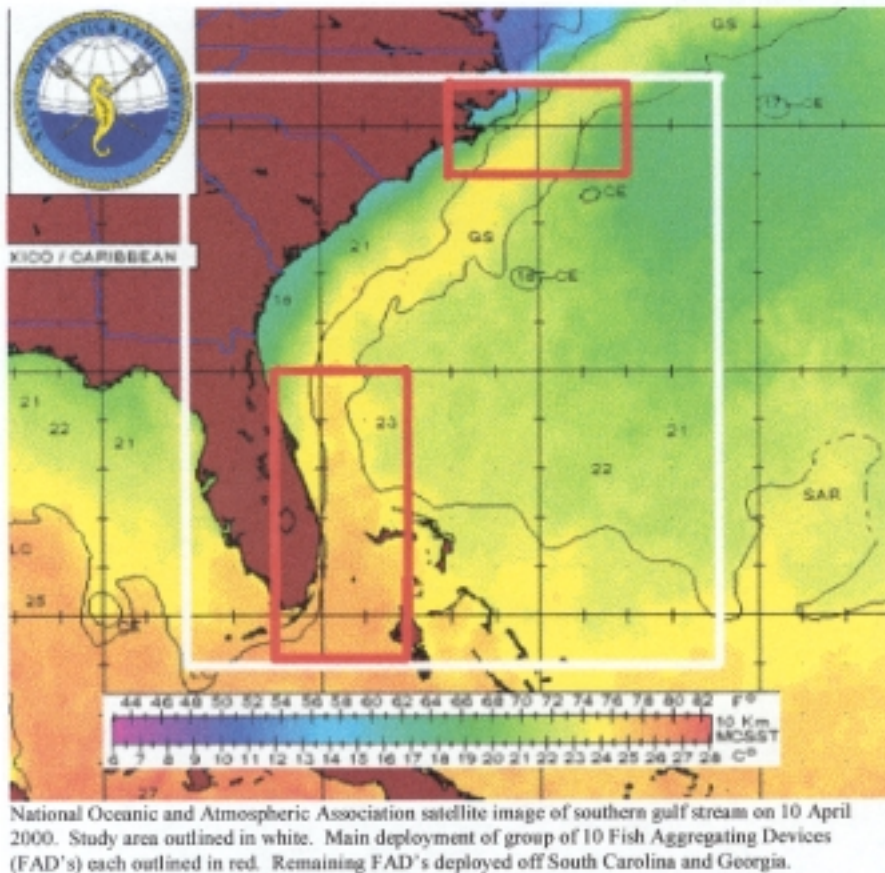
Introduction

Little is known about the specifics of billfish populations along the eastern seaboard of the United States. There have been some efforts to study billfish migration patterns, feeding habits, and spawning areas, but very little data has been gathered on populations in the western Atlantic Ocean. However, a new technology utilizing satellite tags to track and monitor individual fish has the potential to gather data that in the past would have been extremely **difficult**, if not impossible to obtain. At one time Atlantic Bluefin Tuna were as much of a mystery as billfish species in the Atlantic today. However, pioneering efforts at tagging Bluefin Tuna with satellite tags have yielded a wealth of information on that species that researchers have found invaluable and enlightening. With the pressures of fishing and pollution increasing on all marine species, scientists will need a baseline measurement **of** billfish populations from which future research can be done more effectively as well as be compared to the initial surveys to track any changes in billfish populations that have occurred.

Populations of swordfish (*Xiphias gladius*), blue marlin (*Makaira nigricans*), white marlin (*Tetrapturus albidus*), sailfish (*Istiophorus platypterus*), and longbill spearfish (*Tetrapturus pfluegeri*) will **be** studied whenever possible --- all **five billfish** species are targeted. This study will be conducted over two years. The target area will be

the eastern coast of the United States from Cape Hatteras to Florida, concentrating primarily on the Gulf Stream current and its boundary edges. (see figure 1)

Figure 1



One of the main reasons to study Atlantic billfish populations specifically is to better discern their distribution throughout the study area. These fish are very valuable to recreational and commercial fisherman. By tracking the fish, data can be collected on what temperature waters they prefer, where and how they travel. However, the value of



billfish as part of their natural habitat is not really known, and only by studying these elusive fish can their lives be understood and documented.

Objectives

1. - To deploy Fish Aggregating Devices (FAD's) primarily off Cape Hatteras and Florida and along the Gulf Stream current.
2. To utilize the FAD's for catching billfish, tagging them with satellite tags, and releasing them.
3. To use Remotely Operated Vehicles (ROV's) at FAD's to try and study billfish *in situ*, possibly allowing a diver to go overboard for closer study.

The main objective of this study is to find billfish and tag them. To this end FAD's will be deployed, allowing prey communities to develop which will attract the **billfish** and make tagging and releasing the fish more successful. Also at the FAD'S, *in situ* study will be attempted after first "scouting out" the area using a small ROV. Any new data that can be collected on the billfish will be invaluable to understanding these species.

Equipment

- 0 25 FAD's
- 0 2-5 Phantom 300 or smaller ROV's with control equipment
- 0 100 satellite tags (more as needed) and tagging sticks
- 0 Data sheets with waterproof cases

0 10 inexpensive digital cameras and memory disks

0 Tape measure or measuring stick

0 SCUBA gear for midwater observers

Charter captains will have fishing equipment on board their vessels for catching **billfish**, including any electronic equipment necessary to locate FAD's like GPS (Global Positioning System) as well as SONAR devices that can display sound wave returns from schools of fish. Charter vessels must be able to **accommodate** a small ROV and its control equipment, as well as dive gear for underwater observers. **Researchers** will provide the satellite tags and data sheets, measuring devices, and digital cameras. It is not necessary for researchers to accompany every charter vessel attempting to find, tag, and release **billfish** for the study. However, researchers should visit each FAD at least once a month with an ROV, time and weather permitting.

Methods

Fish Aggregating Devices (FAD's) will be deployed from Florida to North Carolina. These devices are simple constructs consisting of a 15' x 15' square lattice of PVC tubing partially **filled** with expandable foam with 4"-6" between each crosspiece for attachment of organisms near the sea surface. A mesh net hanging 10 fathoms or 60' down (total measure: 15' x 60') from the lattice will provide more attachment area for organisms and take advantage of the different gradations in sunlight throughout the water column. A **1/2"** chain will be attached to the bottom of the hanging mesh to weigh it

down, and the mesh will also need to be coated in "**fish** solubles" to initially attract organisms to the FAD. A Dacron line with a float, flag, and strobe attached will mark the FAD on the sea surface. Another Dacron line with at least 3 heavy-duty swivels attached will serve as a mooring line to connect the FAD by the lattice to a 500 lb. concrete anchor. The FAD will attract organisms for attachment, which will in turn attract predators and other fish that will create a prey community where top predators such as billfish will find prey. These "oases" in the ocean will make fishing more productive as captains and anglers will not have to search the entire study area for fish-they can just check each FAD instead.

The more FAD's that can be deployed, the better: no less than 20, but up to 25 would be optimal. Ten FAD's would be placed primarily off Cape Hatteras in various water depths along the edge of the Gulf Stream. One or two FAD's will be deployed along the eastern boundary of the Gulf Stream, but the long distance from port will allow only a very few FAD's to be anchored there. Ten more FAD's will be deployed off the Florida coast with some as far east as the Bahama Islands. The remaining five FAD's will be deployed along the east coast off the states of Georgia and South Carolina. The exact location of the FAD's will be determined later after consultation with saltwater anglers and charter captains. Once positions of the FAD's are determined they will be published in the monthly update *Notice to Mariners* so transiting vessels will know exactly where these devices are and can avoid them when necessary.

Once the FAD's are deployed, it will take 4-6 weeks for communities of sessile organisms to develop. Once these initial communities **develop, predators such** as billfish will congregate, attracted by smaller prey such as tuna, mackerel, dorado, and other fish

feeding on the attached organisms. With the cooperation of the recreational charter fleet, each FAD will be checked at least once a month, weather permitting, and more frequently as anglers pursue **billfish** for sport purposes, which in turn will only increase the quantity of data collected and tags implanted.

Deployment and Tagging

Once the FAD's are deployed, the tagging and observation phase will begin. Charter boat captains and other anglers will be given the opportunity to fish the FAD's using conventional hook and line gear for tag-and-release of fish ONLY. Conventional gamefish tags as well as satellite tags that cost \$1,000/each will both be affixed to the **fish**. One hope is that fishermen may be persuaded to help offset the cost of expensive billfish tags that collect data and uplink to a satellite with tracking information, much like the current Tag-A-Giant Bluefin Tuna tagging operation. Rewards will be offered to charter boat captains for a certain number of billfish tagged, observed, recorded, and released.

Anglers would need to be trained in applying and recovering **billfish** tags to reduce fishing mortality. A small kit of tools and equipment should be supplied to participating captains including billfish tags, tagging sticks, data sheets, and a digital camera with a supply of memory disks for recording and photographing each tagging. A measuring device, either in the cameras (infrared) or a measuring tape is needed to get an estimate of fish length. With every fish tagged and released participating captains would need to fill out data sheets to gather data on when, where, and under what conditions each **fish** is caught. (*see figure 2*)

Captains and anglers will troll for billfish primarily at the FAD's (or wherever they can find billfish) and catch the fish using hook-and-line methods. Once the billfish has been brought to the boat, a tagging stick loaded with a satellite tag set for either 30-day, 3 month, 6 month, or 9 month release will be used to implant the tag into the body of the **billfish** right below the dorsal fin. If possible, a non-nal numbered tag should be implanted as well right behind the satellite tag. The satellite tags will take hourly measurements of water temperature and position, and at the preset release time the tag will float free from the billfish to the sea surface and transmit its data to a satellite orbiting above. The data from the satellite tags will show the track of the billfish during the time the tag was attached, and what water temperature the **fish** favored during the same period. This will enable researchers to map when and where each individual fish goes, if it swims with other **fish**, and general patterns of travel throughout the study area and possibly beyond it.

In Situ Observations

When researchers accompany charter captains out to FAD'S, ROV's could be brought on board and used to visually inspect each FAD to see what organisms have accumulated and what bait may or may not be attracting the target fish. If a large number of target fish are spotted, scuba divers could slip into the water for *in situ* observations of group compositions, behavior, and condition. If possible, divers that are qualified to use rebreathers would be the best choice to minimize disturbing the **billfish** with bubbles from conventional scuba diving gear. These opportunities to dive on a FAD with **billfish** would be rare, but should be utilized to the utmost if a target fish or a group of target fish is spotted. Disturbance of the target fish should be avoided at all costs however.

The use of an ROV to "scout out" the FAD and see if target species are present will cut down on the "unproductive" fishing time spent at a FAD without knowing whether or not target species are present. If **fish** are absent, the captain can move on to the next FAD to see if it has fish around it.

Importance

The importance of gaining insight into the distribution of different billfish populations in the Atlantic cannot be stressed enough. Knowledge of where **billfish** travel, what they eat or are attracted to, where they are most likely to be found, how they hunt (if direct observations are made underwater), what groups they travel in if any, and where they may breed is desperately needed to insure the protection and survival of all **billfish** species. Overfishing is only one of many factors believed to contribute to population decline but there is no hard data to begin real analysis of these problems.

Only a very in-depth and detailed study over a long period of time will begin to yield data needed to implement proper fisheries management proposals. A massive effort is needed to observe these elusive and presumably highly migratory billfish species. Immediate action must be taken if species like the Atlantic Swordfish are to survive for the benefit of future generations and the health of the marine ecosystem. Until the habits of these fish are understood, no effective management plan can be undertaken.

Alternative Approach

There are many types of tagging methods, including radio and traditional tags that could be used in an attempt to obtain data on fish migration. However, satellite tags are the only method that will provide the day to day information we hope to obtain. Any attempt to follow these species with an ROV, submersible, or research vessel would be futile. Furthermore, the past successes of satellite tagging programs throughout the world make us positive that this is the only method to use for our research. As far as alternatives to the capture of the target species we are unaware of any other method that would not cause serious harm to the fish or be very unproductive. Methods like longlining, spearing, or shooting the tags into a **small** and fast target like a **billfish** would not only be a waste of resources considering how seldom **billfish** are seen at the surface, but the mortality rates of the fish would be unacceptably high. Thus the only feasible and cost-effective method for research is the plan outlined above.

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